# THE HOUSE PHYSICIAN'S HANDBOOK

# THE HOUSE PHYSICIAN'S HANDBOOK

BY

C ALLAN BIRCH

MD., FRCP

*Physician*

*Chase Farm Hospital Enfield*

E & S LIVINGSTONE LTD

EDINBURGH AND LONDON

1955

*Printed in Great Britain*

# PREFACE

THIS small book has been compiled to provide information about many of the procedures which the house physician will have to use or know about day by day in his work Some teaching hospitals have issued valuable books of this type It is hoped that doctors working in Regional Hospitals will find this one equally useful

The doses of all newer drugs are given in the Metric System but the Imperial System is used for drugs at present commonly prescribed in it The approximate Metric equivalent is added in the hope that the house physician will learn it as a step towards the day when Metric doses alone will be used

As the list of subjects which could have been included is endless criticism of the present selection and sug gestions for its improvement are expected and will be welcomed

C ALLAN BIRCH

CHASE FARM HOSPITAL
ENFIELD MIDDLESEX
1955

# CONTENTS

# INTRODUCTION

YOUR resident post in hospital provides a great opportunity for you to learn about the continuing care of the patients under your charge Make the most of this Watch carefully day by day the course of illness and the effect of treatment Learn all you can of the art of prognosis and of dealing with relatives

Much of this book is about the technical procedures used in diagnosis and treatment but you should not regard your patients merely as interesting cases on whom to use these techniques They are human beings many of them anxious worried and full of doubts and fears The picture each presents will be coloured by his emotional make up Always remember that you are treating patients and not diseases for as Trousseau said long ago Il n y a pas de maladies il n y a que des *malades*

For all patients the best doctor is the one who can best inspire hope In all your work therefore do not forget the human touch

'Tis the human touch in this world that counts
The touch of your hand on mine
*Which means far more to the fainting heart*
Than shelter and bread and wine
For shelter is gone when the night is o er
And bread lasts only a day
But the touch of the hand and the sound of the voice
Sing on in the soul alway

Spencer Michael *Free 1856 1938*
M D Johns Hopkins 1880

# CHAPTER I

## *General Duties and Information*

### On Arrival

1 Try to meet your predecessor before he leaves and learn from him the peculiarities of the job

2 *Fairly soon after arrival make yourself familiar with* the administrative arrangements of the Laboratory the X ray Department the Dispensary the Records Department and the Almoner s Office

3 Make sure that you are a member of a Medical Defence Society and that your subscription is not in arrears Many Hospital Management Committees *make this a condition of employment*

### On Departure

1 Complete and return all outstanding case notes

2 Return all library books and keys

3 Ask your chief for a testimonial

4 Leave a forwarding address

### Etiquette and Advice

1 Don t put a practitioner through a viva voce when he requests a bed for his patient He probably knows more about the common causes of acute illness than you do

2 If you are only a locum preserve the status quo Leave any improvements to the permanent staff

3 Don t write letters to committees without consulting your chief first Your requests are then more likely to receive favourable consideration

4 When another member of the staff has seen your patient previously be careful not to leave him un informed or not consulted without reason He and the patient may be pleased to meet again

5 Never let the patient see that you are in a hurry

6 *Don t pooh pooh the patient s suggestions but give* them courteous consideration

7 Remember that if a patient is not satisfied his treat ment is incomplete Curb any aptitude for debate or taste for recrimination as far as he is concerned

8 Don t think it infra dignitatem to ask Sister s opinion She has had much experience

9 Always be reassuring to the patient even when you have to tell his relatives the sad truth Kipling said The most powerful drug in medicine is the spoken word

10 Whatever you tell the patient let it be in words that he can understand Except ye utter by the tongue words easy to be understood how shall it be known what is spoken For ye shall speak into the air I Corinthians XIV 9

11 Use your unaided senses first Eyes without the microscope ears without the stethoscope wits without the help of chemistry and radiology not that we should deny ourselves the proper use of these can often carry us a long way John Ryle So order investigations with discrimination and use the least unpleasant ones first.

12 Read Sir William Osler s address Aequanimitas

## CASUALTY DUTIES

You may be called on to do a period of casualty duty in the evenings Do not change this without notifying the

Receiving Room and the telephonist If you are likely to be elsewhere than in your wards or room let the Receiving Room and the telephonist know where you can be found

When admitting a child it is very helpful to record whether he has had measles etc

It is necessary to remind all housemen that in the case of a possible fracture no matter how trivial the injury you should always

1 Have the patient X rayed and see the wet film
2 Give the patient appropriate treatment and refer him to the next fracture clinic
3 See the radiologist s report later

## Note Taking

This art is by far the most important part of the clinical examination and great care should be spent on it The patient s story should be elicited and written down legibly under the headings—History of the present condition Past Illnesses and Family History though not necessarily in this order It is often best to let the patient tell his story to the doctor in his own way and in some cases alone in a quiet room He may have to be coaxed to find words to express what he feels Do not hinder this by using what may be an unsuitable mode of address but try to size up the patient and sense which approach is best to make

In the case of a child find out from the parents before they leave whether he has had the various fevers and when and also what immunising injections have been given The various systems should be examined and the findings recorded A brief summary of the positive and important negative findings is useful as are also a final few words showing how the patient was disposed of It

is well to initial or sign the notes If you have to write letters about the patient make it clear that you do so on behalf of your chief

Try to avoid abbreviations especially private ones and also facetious comments and exclamation marks You do not know who may read your notes later and you may meet them again in a court of law If your hospital uses a unit system for records put the patient s unit number as well as his name on all his papers You should also try to complete any items on the Details Sheet which were omitted by the Admissions Officer *e g* the National Health Service Number

A more elaborate examination should be made of the system or part which seems to be mainly involved On almost every patient it is advisable to record the blood pressure the result of urine testing and to have the chest X rayed and the haemoglobin estimation made

When certain diagnoses seem probable the house physician may order the various investigations and per form the necessary manipulations on his own initiative *e g* in septicaemia (blood culture) in possibly syphilitic conditions (Wassermann reaction) and so on But he should beware of ordering without due forethought a large number of tests or tests involving much labour in the laboratory (*see page* 65) He should always explain to the patient what it is proposed to do Acquiescence in the examination implies consent but for anything of an operative nature a form of consent should be signed

### PATIENTS WHO DO NOT SPEAK ENGLISH

The following words and phrases may help the house physician faced with a patient who speaks no English

| English | French | German | Italian |
|---|---|---|---|
| What is your name? | Comment vous appelez vous? | Wie heissen Sie? | Come vi chimate? |
| Are you married? | Etes vous marié(e)? | Sind Sie verheiratet? | Siete sposato (sposata)? |
| How old are you? | Quel âge avez vous? | Wie alt sind Sie | Quanti anni avete? |
| Where do you live? | Ou habitez vous? | Wo wohnen Sie | Dove abitate? |
| What is the matter? | Qu avez vous? | Was fehlt Ihnen? | Quali disturbi? |
| Where is the pain? | Ou avez vous mal? | Wo tut es weh? | Dove e che vi fa male? |
| Have you had an operation? | Avez vous été opéré(e)? | Sind Sie operiert worden? | Avete subito un intervento operatorio? |
| Have you had a similar attack before? | Avez vous déjà eu une maladie semblable? | Haben Sie schon mal einen ähnlichen Anfall gehabt? | Avete avuto prima un simile attacco? |
| Take off your shirt | Enlevez votre chemise | Ziehen Sie Ihr Hemd aus | Volete toglìervi la camicia e la maglia |
| Lie on the couch | Couchez vous sur le divan | Legen Sie sich auf das Sofa | Sdraiatevi sul lettino per favore |
| Open your mouth | Ouvrez la bouche | Öffnen Sie Ihren Mund | Aprite la bocca per piacere |

| E gl h | F h | G rm | Ital n |
| --- | --- | --- | --- |
| Say Ah! | Dites Ah! | Sagen Sie Ah! | Dite Ah! |
| Say 99! (or phrase used for same purpose) | Dites 33! (trente trois) | Sagen Sie 99! (neun undneunzig) | Dite 33 (trentatre) |
| Swallow | Avalez | Schlucken Sie | Inghiottite |
| Cough | Toussez | Husten Sie | Tossite |
| Keep still | Restez tranquille | Stehen Sie still | Ed ora—state fermo |
| Breathe deeply | Respirez profondement | Atmen Sie tief | Respirate profondamente |
| Draw up your knees | Soulevez les genoux | Ziehen Sie Ihre Kniee hoch | Piegate le ginocchia e tiratele su |
| This will not hurt you | Ceci ne vous fera pas mal | Das tut nicht weh | Questo non vi fara male |
| Don t be afraid | N ayez pas peur | Haben Sie ke ne Angst | Non abbiate paura |
| I shall not be long now | Je ne serai pas long temp maintenant | Einen Augenblick | Ho quasi finito |
| You are very good | Vous etes très brave | Sie sind sehr tapfer | Bravo cosi va bene |
| All over | C est fini | Das is alles | Ho finito grazie |
| Medicine | Médecine | Medizin | Medicine |

| E gl h | F h | G m | It l an |
|---|---|---|---|
| For external use | Pour usage externe | Fur ausserlichen Gebrauch | Per uso esterno |
| Do not drink it! | Ne buvez pas cela! | Nicht trinken! | Non bevetelo! |
| Three times a day | Trois fois par jour | Dreimal taglich | Tre volte al giorno |
| Accident? | Accident? | Unfall? | Accidente? |
| All right? | C est bien? | Gut? | Va bene? |
| Good? | Bon? | Gut? | Bene? |
| Bad | Mauvais | Schlecht | Cattivo |
| Better | Mieux | Besser | Meglio |
| Black | Noir | Schwarz | Nero |
| Blood | Sang | Blut | Sangne |
| Bowels open today? | Avez vous le ventre libre aujourd hui? | Haben Sie heute Stuhlgang gehabt? | Sie audato di corpo oggi? |
| Cough! | Toussez! | Husten! | Tossi! |
| Cough? | Toussez vous? | Husten Sie? | Tosse? |
| Fever | Fièvre | Fieber | Febbre |

| English | French | German | Italian |
|---|---|---|---|
| Headache | Mal de tête | Kopfweh | Male di capo |
| Hospital | Hôpital | Krankenhaus Hospital | Ospedale |
| How many days? | Combien d heures? | Wie viele Tage? | Quante ore? |
| Hungry? | Avez vous faim? | Haben Sie Hunger? | Avete fame? |
| Injection | Injection | Einspritzung | Iniezione |
| Look out! | Prenez garde! | Achtung! | Badate! |
| No | Non | Nein | No |
| Not | Pas ne pas | Nicht | Non |
| Pain | Douleur | Schmerzen | Dolore |
| Pregnant | Enceinte | Schwanger | Gravida |
| Rigors | Frissons | Schüttelfrost | Accessi febbrili |
| Sputum | Expectorations | Auswurf | Spredo |
| Temperature and pulse | Température et pouls | Temperatur und Puls | Temperatura e polso |
| Thirsty? | Avez vous soif? | Durstig? | Avete sete? |

| English | French | German | Italian |
|---|---|---|---|
| Today | Aujourd'hui | Heute | Oggi |
| Tomorrow | Demain | Morgen | Domani |
| Tonight | Ce soir | Heute Abend | Stanotte |
| Urine | Urine | Urin | Urina |
| Vomited? | Avez vous vomi? | Haben Sie erbrochen? | Avete voi vomitato? |
| When | Quand | Wann | Quando |
| Where | Où | Wo | Dove |
| Yes | Oui | Ja | Sì |
| Yesterday | Hier | Gestern | Ieri |

*Further help in other languages may be obtained from* the British Red Cross Society s language cards (14 *Grosvenor Crescent London S W 1 SLOane 5191*) When pronunciation is a difficulty progress may be made by pointing to the *appropriate word Often a colleague* or nurse can be found who speaks the language in question

## Signs of Death

In cases of long illness it is not difficult to decide when death has occurred Cooling rigor mortis and post mortem changes are the infallible signs and in some cases *e g* drowning they should be awaited before re suscitative measures are given up In other cases of probable sudden death *e g* coronary occlusion *cessation* of circulation as shown by auscultation is the best sign *Death cannot be considered as certain until* the heart has stopped beating for at least five minutes Fragmentation *of the column of blood in retinal vessels* ( cattle trucking ) is a useful sign coming on within a few minutes of death and soon passing off If requested to perform a special test of death expose the radial artery at the wrist and cut it across Having demonstrated the absence of bleeding apply a strip of plaster

## How Long Dead?

You may occasionally be asked your opinion as to *when death* occurred In the case of a recently dead person it is well to collect the evidence (rectal tem perature) on which this opinion can be based Since the rate of fall of body temperature after death is approxi

mately 1 5 F per hour in room temperature between 50 F and 70 F the number of hours since death is given by the formula

$$\frac{\text{98 4 minus rectal temperature}}{\text{1 5}}$$

The result should be interpreted with caution The state of rigor mortis may be helpful It starts on the face six hours after death and reaches the hands and feet at twelve hours it stays for twelve hours and takes twelve hours to pass off

### Permission for Post Mortem Examinations

After death the patient s body is the property of the relatives and while not a strict legal requirement their permission should be sought before a post mortem examination is made In some hospitals a special person in the records or almoner s department interviews the relatives but in others it is the doctor s job

You may already have some idea of the mental attitude of the relatives and this will help you in the kind of approach to be made If possible see the responsible relative in a quiet room and let him be seated Allow him to discuss the illness and ask questions One of these will often give the opportunity to say that a true answer can only be given after a post mortem examination has been made Failing this you should make a direct request for permission to make the examination Stress the fact that it is in the interest of the relatives and their descendants to know the exact cause of death In most cases permission is readily given

When objections are raised don't make a begging approach or the relatives *may feel they would be doing* you a favour in giving permission Point out that post mortem examinations are quite usual that the body is not disfigured and that the face is not touched Dispel any misconceptions that the body will be ' experimented on or used for teaching anatomy

If you *have some real doubt as to the cause of death* you may say that you would find it difficult to sign a certificate and that one giving an *uncertain* cause would be refused by the registrar and referred to the coroner It is unfair however to use the possible alter native of an inquest as a definite threat (Once a case has been reported to the coroner a post mortem examina tion can only be made with his consent) Sometimes a partial examination is allowed Always then be careful to tell the pathologist lest he do too much

If the relatives ask to be told the findings send them a letter written in simple non technical language Try to reassure them if possible that the cause of death was such that in the present state of medical knowledge no treatment could have prevented it

## Death Certificates

There is considerable confusion in the minds of many doctors on the subject of *death certificates and notifica tion* of the coroner It is hoped that the following notes will make the present position clear

It is usually the houseman s job to certify the cause *of death on the prescribed form to the best of his* knowledge and belief and without fee Before signing

your first death certificate you would be wise to make an opportunity to study the Notes and Suggestions to Certifying Medical Practitioners in the front of the certificate book and the List of Indefinite or Undesirable Terms

By the Deaths Registration Act 1953 all deaths must be certified if a doctor has attended the patient during his last illness irrespective of whether the doctor or someone else has reported the case to the coroner The doctor who certifies must be the registered (or provisionally registered) medical practitioner *who has been in attendance* during the deceased s last illness He must also have seen the deceased within fourteen days before death or his body after death (but not necessarily both) Unless it is for cremation there is no legal obligation on the doctor to see the body after death but he must be satisfied *e g* from the ward sister s report that the patient is dead The section $\frac{\text{seen}}{\text{not seen}}$ after death by me on the certificate is included to help the registrar to decide whether to report the death to the coroner

The procedure should therefore be as follows —Carefully observe the rules of your hospital about the time and place for signing death certificates

Sign the certificate (for placing in the envelope addressed to the registrar) the Notice to Informant (for handing to the informant) and the counterfoil (for retention) The certificate must be sent to the registrar forthwith

Don t keep the relatives waiting or delay signing until after an autopsy since this would mean two visits for

them—one to give permission and another to get the certificate *Give the certificate at once so that funeral* arrangements can proceed In the case of a cremation certificate however it is generally best to complete *this* after autopsy since the cause has to be certified definitely and not just to the best of your knowledge and belief

If you do not know the cause put down Not known or uncertain In such a case and also if the death was one of those which the registrar is bound by law to report to the coroner (*see page* 15) it will save time if you report the case yourself You should then initial the back of the certificate at A

If there is an autopsy initial space B on the back of the certificate and correct the diagnosis later if need be when asked

If you see a patient for the first time who is moribund and who dies in the receiving room you are not qualified to give a death certificate since it has been held that one attendance is not sufficient to justify your stating that you attended during the last illness You should ring up the home doctor and if he cannot or will not give a certificate then you should inform the coroner

Scottish death certificates differ in several ways from those in use in England and Wales The causes of death are stated in the reverse order from that used in England and the doctor is not required to say whether they were confirmed by post mortem or whether he has seen the body after death There are no provisions for initialling the back of the certificate there is no Notice to Informant certain particulars about pregnancy are required and the certificate must be delivered to the registrar within seven days

### NOTIFICATION OF THE CORONER

The Registrar of Deaths is the chief person whose statutory duty it is to report to the coroner (or in Scotland the Procurator Fiscal) deaths which seem to him to come within the coroner s jurisdiction There is no similar statutory duty laid on a doctor as such though this duty may apply to him in his capacity as head of an institution such as a mental hospital It may be that the coroner has a social or moral claim on the doctor as on anyone else to report an unnatural death to him but as such a claim would have no statutory basis and as in any case the test of enforcement could not be applied no claim of this sort is exercised The doctor and indeed anyone else should be careful that he could not by any intended act or omission be held to be obstructing the coroner in his duties A system of cordial co-operation has grown up whereby coroner s cases are reported direct to the coroner by the doctor and this is very convenient to all concerned If you are in doubt as to whether the coroner should be informed consult your chief or the records officer or have a word with the coroner s officer himself

Deaths which it is the registrar s statutory duty to report to the coroner are —

1 those where a registered medical practitioner was not in attendance

2 those where no certificate can be given

3 those where the deceased was seen neither after death nor within fourteen days before death

4 those where the cause of death is unknown (*i e* where there is an uncertain certificate)

5 those where death was unnatural due to accident violence or neglect or where it occurred under suspicious circumstances

6 those where death occurred after an operation

7 those where death was due to abortion industrial disease or poisoning

The list of industrial diseases is modified from time to time and includes —anthrax chrome ulceration compressed air sickness epitheliomatous ulceration toxic anaemia toxic jaundice and poisoning by aniline arsenic benzene beryllium carbon di sulphide lead manganese mercury and phosphorus *It would be wise to* include also deaths from alcoholism and drug addiction and any unusual diseases like glanders or those of possible accidental origin like Weil s disease

Some coroners ask that all deaths within twenty four hours of admission to hospital should be notified to them but this is a purely private local arrangement

In a case of great clinical interest which from some accident comes under the coroner s jurisdiction the house *physician should make a special request to be present* at the autopsy (*see page* 17) Otherwise valuable material although of no medico legal importance may remain unexamined

### ATTENDANCE AT A CORONER S POST MORTEM EXAMINATION

Although it is within the power and discretion of the coroner to say who may be present and who may be excluded from a post mortem examination there is usually

no objection to your attending if you do so purely out of medical interest If you had assisted at an operation or had given an anaesthetic to the deceased person and might be deemed to have been negligent then you should not attend without the coroner s consent Under the Coroners (Amendment) Act 1926 you could send a representative

### Rough Weights in Ounces of Certain Organs

(For ranges sex differences and weights of other organs see the table in the post mortem room)

| | |
|---|---|
| Thyroid | 1 oz (30 G) |
| Pancreas | 3 oz (90 G) |
| Kidneys | 4½ oz each (135 G) |
| Spleen | 6 oz (180 G) |
| Heart | 10 oz (300 G) |
| Liver | 50 to 60 oz (3 lb +) (1 5 to 1 8 Kg) |

### Death Bed Wills

The house physician or anybody else (*e g* a nurse even if under twenty-one) may witness the signature to a will If asked the house physician may help a patient to *make* his will if a solicitor is not available and if he is satisfied that the patient is of sound disposing mind ' If a special form is not used simply write *in ink* on plain paper as follows —

This is the last Will and Testament of Mr A B of in the county of I revoke all former Wills by me made I appoint to be the Executor(s) of this my Will

*(Here follow all bequests and instructions)*

In witness thereof I have hereunto set my hand this day of one thousand nine hundred and Signed and acknowledged by the said A B the testator as and for his (her) last Will in the presence of us both present at the same time who at his (her) request in his (her) presence and in the presence of each other have hereunto subscribed our names as witnesses

*Testator s signature*

*Witness s signature address and occupation*

*Witness s signature address and occupation*

*(Witnesses must not be executors or persons who benefit under the Will)*

## DYING DEPOSITIONS AND DECLARATIONS

The house physician may be asked to take down the statement of a dying patient He would generally be wise to do so although there is no legal obligation

When the *patient* is in settled hopeless expectation of death the statement he makes is a *dying declaration* It is limited to cases of homicide but is only admissible as evidence in reference to the person who makes it What he says should be written down in full together with any questions used to elicit full information and their answers The phrase Having the fear of death before me and being without hope of recovery must be included The presence of a magistrate is unnecessary The declaration should be signed by the dying patient if possible and by the person who writes it down Witnesses are not necessary but are desirable

When it is the *doctor* who thinks the patient is unlikely to recover but the patient is unaware of the imminence of death the statement taken is a *deposition* A magistrate

should be summoned and he will see that the legal requirements are complied with

### EMBALMING

The probability of having to embalm a body is remote but when it has arisen it has usually been bungled by the young doctor It is always best to call in the expert but these instructions are given to help the house physician who may have to comply unaided with a request to preserve a body

1 If no embalming materials are available ice or solid CO should be packed around the body which should be kept in the coolest available place
2 In the absence of ice or instruments other than a syringe any available antiseptic (preferably formalin) should be poured into the mouth and injected into the chest and abdomen The coffin should then be packed with a mixture of ashes or sand with chloride of lime (bleaching powder) This will delay decom position but should not be used if the relatives wish to view the body later
3 For embalming various solutions containing formalin are used A good one is —

| | |
|---|---|
| Formalin (40 per cent ) | 4 pints (2 25 litres) |
| Carbolic acid (crystalline) | 1 lb (500 G ) |
| Water | 2 gallons (9 litres approx ) |

*i e* roughly 20 per cent formalin and 4 per cent carbolic acid in water Very much weaker solutions are adequate for newly-dead tissues

There are many excellent proprietary solutions ( Arandee Carswan and ' 20th Century ) For obvious medico legal reasons arsenic should

never be used In most cases two gallons of solution will be needed for an adult

*Technique* —To avoid fixation in awkward positions the body should be horizontal and the eyes and mouth closed If necessary a thread may be inserted round the lower jaw and through the nasal septum and tied A small pad of vaselined wool under the eyelids improves the facial appearance Rigor mortis should be broken down by moving all joints Any necessary shaving should be done before injecting The lips should be smeared with petroleum jelly to protect them against preserving fluid regurgitated from the lungs

The axillary artery and vein are exposed and the vein divided Using a Higginson s syringe or a cannula connected to a cistern three to six feet high the artery is first injected both ways with warm water containing four teaspoonfuls of salt to a bucketful This washes out all the blood and avoids trouble from possible coagulation by formalin The washings can be collected by a special cannula in the vein to avoid undue soiling of the bed The embalming solution is then injected and its penetra tion aided by gentle massage Complete distribution can be aided by cutting off the venous drainage at intervals

Enough has been used when it begins to return from the vein and the tissues assume a definite firmness Any parts which do not firm up should be separately injected The body cavities and bladder should be aspirated and injected separately using a 12 inch trocar through a small incision just above the umbilicus

If a post mortem examination has been performed then the six point method must be used This consists of injecting in both directions each carotid axillary and femoral artery In addition the wall of the abdomen and

chest must be infiltrated by needle and syringe The soft viscera are best destroyed otherwise they should be soaked for twenty four hours in the solution and then returned If autopsy is performed after embalming it should be delayed twenty four hours

The cosmetic aspect should not be ignored The body should be smeared with petroleum jelly (preferably con taining 10 per cent of thymol to prevent the growth of moulds)

## On Certain Religious Matters

These brief notes are included to guide the house physician on religious matters concerning his patients He should be on friendly terms with all visiting clergymen and religious workers and help them in every way possible in their work Only urgent and essential treatment should delay their access to patients

**Church of England patients** —The clergyman is usually informed by the relatives that the patient is in hospital or by the ward sister at the patient s request When Holy Communion is administered a table or locker with a white cloth and a medicine glass of water are provided at the bedside behind screens When anointing is requested a little cotton wool should be put out also

**Roman Catholic patients** —The priest is usually sum moned by the nursing staff but it is well that the house physician should know how and when this is done The priest should be informed as soon as a Roman Catholic patient is placed on the Seriously Ill List It is helpful if he can be told if the patient is unconscious If a Roman Catholic patient is brought in dead or quickly dies the priest should be informed nevertheless Extreme Unction or Last Rites are administered to seriously ill

patients and for this it is usual for the ward sister to provide the same materials as for Church of England patients A small vase of flowers may be included Similar preparations are made for Holy Communion The patient must be fasting though a cup of tea an hour previously is allowable Medicines need not be omitted

**Patients of other denominations**—The Minister concerned will make his requirements known to the ward sister

**Jewish patients**—When a Jewish patient dies the body should not be removed to another room but should be kept in the ward at least until dawn and preferably not taken to the mortuary until a watcher arrives In the case of a moribund Jewish infant no special measures are called for and after death the procedure is as for an adult Post mortem examinations are usually only performed on Jewish patients on the coroner s order

## Baptism

The house physician should know what to do if faced with a request for baptism of a very ill child The clergyman should be summoned if possible and baptism by a lay person such as a doctor or a nurse should be performed only in a case of necessity The reality of the necessity however is for the person performing the baptism to decide

Baptism may be administered by any sane person male or female whether he or she has been baptised or not and irrespective of religious belief provided it is intended to do what the Church does Two things are necessary (1) Invocation of the Holy Trinity and (2) the use of water If these are used baptism is valid Godparents are unnecessary in an emergency

The doctor s fingers moistened with water should touch the child s forehead while he says I baptise thee (A) in the name of the Father and of the Son and of the Holy Ghost (Roman Catholics require the water to be poured) A name is not necessary for emergency baptism

If there is any doubt particularly in the mother s mind as to whether baptism has already been performed or whether the child is alive the baptism should be made conditional by prefacing the above words with If you can be baptised The clergyman of the parents denomination should be informed afterwards

## MEDICO LEGAL NOTES

Many doctors are very vague about certain medico legal points and so a few selected subjects of general interest are briefly mentioned here When any circum stances may even remotely involve the doctor in medico legal difficulties the best advice he can be given is that he should inform his medical defence society at once of all the circumstances in detail He must not have neglected of course to pay his annual subscription and every newly qualified doctor is strongly advised to do this by a Banker s Order (A pre registration house physician can join a medical defence society on taking up his appointment and is entitled to full benefits and privileges)

### Ownership of Clinical Records

Clinical records are the property of the Hospital Management Committee It is perfectly proper for the Committee to call for them when confronted with a situation *e g* legal proceedings necessitating their examination It is not permissible for committee members to peruse them for personal reasons

Occasionally a patient prefers that certain facts should not be recorded in black and white in the notes Then and also when you feel it would be prudent to omit them either nothing should be written down in the notes or the papers should be kept in your private file

A tactful records officer before handing over a patient s records to the Committee s representative will first seek the formal permission of the doctor concerned On some occasions it would be wise to obtain the patient's written consent first

## RESPONSIBILITY OF HOUSE PHYSICIANS

There are certain duties which you can properly perform without reference to your chief *e g* lumbar puncture in possible meningitis There are other duties about which your chief should first be consulted When you engage in a procedure which is well within your competence and skill and which is within the general delegation which you enjoy then you can be held responsible for all that flows from that procedure So long as you restrict your activities to the orbit within which it is usual for a house physician to act then your chief can repudiate responsibility for any mishap As he cannot do all the work himself you are there to help him but he has a responsibility for the supervision of your work and so might be involved also in any action against yourself

*Under the provisions of the Medical Act 1950 sub* section 3 a pre registration houseman is entitled only to carry out duties assigned to his appointment *i e* he can only practise in hospital

### House Physicians who are Married Women

As confusion may arise *e g* on certain certificates if a registered medical practitioner does not use the name by which he or she is registered with the General Medical Council a married woman practitioner should continue to use her maiden or other name in which she was originally registered She can change her name in the Medical Register by sending her written request with her marriage certificate and a fee of five shillings to the General Medical Council 44 Hallam Street London W 1

### Students in the Wards

Many students now work not only in teaching hospitals but also during vacations in regional hospitals Their position in the wards has never been defined by legal decision You should therefore only give them duties which they could reasonably be expected to perform In any legal action the circumstances of the case would be all important and also whether the student exercised what was regarded as a reasonable degree of skill and care Only a registered medical practitioner (or a pre registration houseman in hospital) may legally prescribe a dangerous drug but a student or nurse may legally administer it

### Measures undertaken by the Nursing Staff

The house physician should remember that if he asks a nurse to carry out some procedure *e g* taking of blood or giving an intravenous injection which is outside the scope of her normal duties he takes the responsibility He should only do this if he has satisfied himself by personal observation of the nurse s competence If he is doubtful

about this he should use the needle himself Nurses who hold the ophthalmic certificate are qualified to remove corneal foreign bodies

### PATIENTS WHO REFUSE TREATMENT

If after clear explanation the patient refuses to stay in hospital or to have treatment as advised the fact should be recorded in the notes The patient should be asked to sign a statement

### ACCIDENTS TO PATIENTS

Should an accident befall any patient go promptly when summoned Enquire into the circumstances examine the patient fully and order any necessary X ray examination Make a written record (on a special form if required) and include a note of the place where the accident occurred It is often helpful to note the condition of the patient s shoes Take all steps necessary to reverse the consequences of any accident If it seems that you may be involved as a cause inform your Medical Defence Society

### DISCLOSURE OF INFORMATION

Normal enquiries by relatives and friends about health and progress should always be answered courteously with patience and in general terms Confidential information is in a quite different category No employer or member of a patient s family or solicitor or other person acting on their behalf should be given any confidential information without the patient s written consent To act otherwise particularly in cases of pregnancy and venereal disease would be to place yourself in a position of peril

with regard to breach of professional secrecy Only by meticulous observance of this rule can you avoid the risk of serious trouble If detailed information is wanted for some specific purpose either during the illness or after wards the patient s written consent to give it should always be obtained

When it is the police who ask and particularly if they ask over the telephone the house physician should refuse to be stampeded by the official atmosphere into saying something which he might later regret It is always best to consult the patient and obtain his consent to give information If this is not possible and the doctor feels it would be ethically wrong to speak he should not do so His knowledge is confidential but he should be careful that his refusal would not be against the public interest or such as to make him liable to be charged as an accessory

### Professional Secrecy when in Court

Professional secrecy is not *legally* recognised and so you have an obligation to answer questions put to you in the witness box It is quite proper however if you find yourself asked for information when you do not hold the patient s consent to disclose it to appeal to the judge nevertheless to take the *professional* rule of secrecy into consideration You should do it when the question is asked and say to the judge My lord it would involve a breach of professional secrecy if I were to answer this question am I compelled to answer? You would then be wise to follow the judge s ruling though you could accept imprisonment for contempt of court instead if you still felt you could not answer

## WHAT TO DO IN A CASE OF ALLEGED RAPE

If faced with this problem the house physician would be wise to seek the help of a senior colleague

Alleged rape is an emergency situation since conclusive evidence of it soon disappears Examination should be made at once but never without the person s consent In the case of a girl under sixteen the consent of the parent or guardian is essential It is best to exclude all relatives and friends and then a detailed history of all the circum stances should be taken A general examination for scratches and bruises should follow The woman should then be thoroughly examined in the lithotomy position in a good light Take charge of underclothing for sub sequent examination for seminal stains Note and take a specimen of any matted pubic hair Look for bleeding and for bruising of the vulva and tearing of the hymen Note the condition of the vagina Using a swab stick moistened with physiological saline make thin smears from the vagina on several glass slides

If requested to examine a male accused of rape only do it with his full consent (preferably written and witnessed) Tell him of his right to refuse look for scratches and bruises and examine the penis for recent turgescence and tears of the frenum Make smears from any meatal moisture

## INSANITY

When a patient s mental state becomes such that he cannot remain in a general ward the house physician s main concern is how to remove him rather than to make an actual diagnosis He should telephone the Mental Welfare Officer (duly authorised) of the Local Health Authority and explain the circumstances It is well to

say in a simple written statement Mr X Y of is suffering from a mental disturbance sufficiently grave for him to need care at once The Mental Welfare Officer will provide the ambulance The patient is taken to a mental observation ward on a three day order There is usually no difficulty but if this procedure is unacceptable to the relatives the psychiatrist should be called in to arrange admission to a mental hospital in one of the various ways If the patient is certifiable this will involve calling in a magistrate This can be done whether the relatives agree or not They cannot refuse to have the patient certified if the magistrate is satisfied on the medical evidence that this is necessary

## DRUNK?

It sometimes happens that the house physician has to decide whether a patient in the receiving room is drunk or ill Consent to any reasonable examination may be presumed if the patient is too drunk or ill to give it The doctor may consult with the police surgeon but he would be wise not to discuss the case with police officers and if asked to write a statement he should make a non-committal one such as I have examined A B on

Make an ordinary physical examination When under the influence of alcohol the temperature is subnormal the pulse rapid and bounding the pupils dilated and sluggish and the tongue dry Speech is slurred and the breath smells of alcohol The patient may gesticulate wildly and break down emotionally Hiccup and salivation are additional features Then apply some special test such as walking along a chalked line smoking a cigarette

reading writing and using a telephone directory If the patient protests that he has taken little or no alcohol let him provide a specimen of urine for testing Keep it in the refrigerator

## Useful Addresses

British Broadcasting Corporation Broadcasting House London W 1 Tel LANgham 4468
British Medical Association B M A House Tavistock Square London W C 1 Tel EUSton 4499
Central Laboratory of N Ireland Hospitals Authority 51 Lisburn Road Belfast Tel 29241
*Central Public Health Laboratory Colindale Avenue London N W 9 Tel COLindale 7041*
Department of Health for Scotland St Andrew s House Edinburgh Tel CENtral 2500
*Lewis s Medical Lending Library 136 Gower Street London W C 1 Tel EUSton 4282*
Medical Defence Union Ltd Tavistock House South Tavistock Square London W C 1 Tel EUSton 4244
*Medical and Dental Defence Union of Scotland Ltd 105 Saint Vincent Street Glasgow C 2 Tel Central 8381*
Medical Protection Society (London and Counties) Victory House Leicester Square London W C 2 Tel GERrard 4814
Medical Research Council 38 Old Queen Street London S W 1 Tel WHItehall 4834
Mental Welfare Officer duly authorised
Ministry of Health 23 Saville Row London W 1 Tel REGent 8411
Oxygenaire Ltd 8 Duke Street Wigmore Street London W 1 Tel WELbeck 4477
Birmingham Victoria 2484 Bristol Abson 281 Cardiff 31361 Exeter Topsham 3070 Leeds 59111 Manchester Sale 56 0 Glasgow Bearsden 4373 Belfast 69766

## Broadcasting S O S Messages

The B B C (LANgham 4468) will broadcast a message asking relatives to go to a sick person only if you certify that the patient is *dangerously ill* and that other means of communication have failed and that the full name of the person wanted is known Messages will not be accepted after the patient has died

## THERMOMETER READINGS

The normal Fahrenheit reading of 98 4 corresponds to 36 9 Centigrade To convert F to C subtract 32 and multiply by 5/9 To convert C to F multiply by 9/5 and add 32

Modern clinical thermometers are not marked with the time they should be kept in the mouth but simply as quick and slow acting In all cases adequate time should be allowed—*usually at least two minutes* *Try to spare* the nursing staff by not expecting routine temperature readings on every patient Those with apyrexial illnesses may be omitted from the temperature round unless their condition suggests otherwise

## Average Weight for Height of a Healthy Adult aged 30 (In Clothes and Shoes)

| Imperial | | | | | |
|---|---|---|---|---|---|
| Height | | Weight | | | |
| | | Man | | Woman | |
| ft | in | st | lb | st | lb |
| 4 | 8 | — | — | 7 | 4 |
| 4 | 9 | — | — | 7 | 7 |
| 4 | 10 | — | — | | 10 |
| 4 | 11 | 8 | 3 | 7 | 13 |
| 5 | 0 | 8 | 7 | 8 | 2 |
| 5 | 1 | 8 | 10 | 8 | 5 |
| 5 | 2 | 9 | 0 | 8 | 8 |
| 5 | 3 | 9 | 4 | 8 | 11 |
| 5 | 4 | 9 | 8 | 9 | 0 |
| 5 | 5 | 9 | 11 | 9 | 3 |
| 5 | 6 | 10 | 1 | 9 | 6 |
| 5 | 7 | 10 | 5 | 9 | 9 |
| 5 | 8 | 10 | 8 | 9 | 12 |
| 5 | 9 | 10 | 12 | 10 | 1 |
| 5 | 10 | 11 | 2 | 10 | 4 |
| 5 | 11 | 11 | 5 | 10 | [illegible] |
| 6 | 0 | 11 | 9 | — | — |
| 6 | 1 | 11 | 13 | — | — |
| 6 | 2 | 12 | 2 | — | — |

For ages between 30 and 55 add 0.2 lb (0.09 Kg) for men and 0.5 lb (0.23 Kg) for women for each year above 30

KEMSLEY W. F. F. (1952). Body weight at different ages and heights. *Ann. Eugen. Lond.* **16** 316-334

## Height and Weight Conversion Factors

| *To convert* | *Multiply by* |
|---|---|
| Inches to centimetres | 2 539 |
| Inches to metres | 0 0254 |
| Feet to metres | 0 3048 |
| Pounds to kilogrammes | 0 4535 |
| Kilogrammes to pounds | 2 2 |

## Convalescence

It is usually easy to decide when the patient is ready to go to a convalescent home The almoner will make the arrangements In some diseases however the decision is difficult and the house physician should not act without advice In two such conditions the following criteria are suggested to help to decide when to allow the patient to get up

**Acute nephritis**—The temperature and sedimentation rates should be normal and there should be less than ten million red cells in a twelve hour specimen of urine (In patients going on to the chronic hydraemic phase these criteria may have to be relaxed Albuminuria is not a reliable index of activity)

**Acute rheumatism and carditis**—It is usual to allow the patient up two weeks after signs of activity (symptoms pyrexia tachycardia and raised E S R ) are gone Sodium salicylate (1 to 2 grains per lb body weight or 120 to 240 mg per Kg approx maximum 100 grains or 6 G per day) should continue to be taken until two weeks after activity has ceased Salicylates should be stopped if cardiac failure supervenes

## POST OPERATIVE ILLNESS

The house physician may be approached by his surgical colleague about a patient in whom something has gone wrong after operation It often means a consultation between the physician and surgeon concerned but the house physician should be aware of the possibilities so as to be able to give his chief a true picture However reassuring the house surgeon is about what his chief did always consider whether something has gone wrong surgically If it is not surgical the following scheme may help

1 *Is it pulmonary?*
   A small pulmonary embolus
   Atelectasis
   Pneumonia —including the results of inhaling foreign matter

2 *Is it cardio-vascular?*
   Coronary thrombosis
   Large pulmonary embolus
   Circulatory overloading
   Shock (peripheral circulatory failure)
   Thrombosis of leg veins

3 *Is it related to fluid intake and output?*
   Salt depletion and extra renal uraemia
   Potassium depletion
   Transfusion reaction

4 *Is it the result of the anaesthetic or operation?*
   Toxaemia
   Fat embolism
   Inhaled vomit
   Pneumothorax

5 *Is it the result of some underlying disease?*
- Diabetes
- Addison s Disease
- Thyrotoxicosis
- Chronic nephritis

### INFECTIOUS DISEASES IN GENERAL WARDS

What should the house physician do when an infectious fever occurs in a general ward? There is no rule of thumb plan about isolation and quarantine Our aim should be to prevent spread of the disease to susceptible patients and at the same time not to interrupt the work of the ward unnecessarily Surveillance often achieves this object better than quarantine but the nursing staff should be told what to look for *e g* slight coryza and rise of temperature Measles rubella chicken pox and mumps can be regarded as almost inevitable and it is a good thing if healthy children can get over them before they grow up Elaborate measures to escape them are not to be encouraged except in special cases Any members of the staff who have not had the disease in question should be carefully watched It is best to let them leave the children s or maternity ward for an adult ward

Erysipelas meningitis and poliomyelitis are of low infectivity and patients can be nursed in general wards if otherwise convenient by barrier methods In order to obtain special treatment and for administrative reasons it may be wiser to transfer them

In the case of certain diseases the Medical Officer of Health must be notified In some areas he wishes to know about rubella also and other diseases may be made notifiable in special circumstances *e g* chicken pox during an epidemic of small pox

The following is a list of notifiable infectious diseases in *England* Wales Scotland and Northern Ireland —

- Cholera
- Diphtheria
- *Dysentery*
- Encephalitis (Acute) (Scotland Infective N Ireland Leth argica)
- Enteric (Typhoid and Para typhoid) Fever
- Erysipelas
- Gastro enteritis in children under two years (N Ireland only)
- Malaria
- Measles (not in Scotland)
- Membranous croup
- Meningococcal Infection (Scot land and N Ireland—Cere brospinal Fever)
- Ophthalmia Neonatorum
- Yellow Fever (N Ireland only)
- *Pemphigus* (N Ireland only)
- Plague
- Pneumonia Acute Primary
- Pneumonia Acute Influenzal
- Poliomyelitis Acute
- Psittacosis (N Ireland only)
- Puerperal Pyrexia
- Relapsing Fever
- Rheumatic Fever (N Ireland only)
- Scarlatina or Scarlet Fever
- Small Pox
- Trachoma (N Ireland only)
- Tuberculosis (N Ireland to Tuberculosis authority)
- Typhus
- Undulant Fever (N Ireland only)
- Vincent s Angina (N Ireland only)
- Whooping Cough
- Food poisoning (or suspected food poisoning) (not in Scot land N Ireland Bacterial only)

**Measles** —A child who contracts measles should be sent home or to the isolation hospital If this is im practicable isolate him in a separate room and use barrier nursing techniques Find out which of the other children have had measles (This should be stated on the admis sion sheet but it is as well to verify the evidence) Nothing further need be done about these children Give the parents of children who are well enough and who have not had measles the option of taking them home possibly to develop this inevitable disease

Gamma globulin (obtainable from The Central Public Health Laboratory Colindale Avenue London N W 9 Telephone COLindale 7041) may be used to prevent or modify an attack It is difficult and expensive to prepare and its use hould be confined to children who have some other serious disease or who are ' weakly ' If the supply

is short restrict its use to children in beds next to the measles case rather than give a smaller dose all round As the attack rate in infant contacts under six months is low they need not be given gamma globulin if one can be quite sure that the mother has had measles

Gamma globulin is issued in ampoules containing 250 mg of protein which should be dissolved in 3 ml of sterile distilled water It is given subcutaneously or intra muscularly within two or three days of the rash in the infecting case in doses according to the following table Immunity conferred by gamma globulin lasts from three to four weeks

| | Under 1 year | Over 1 year and under 3 years | Over 3 years |
|---|---|---|---|
| Prevention | 3 ml (250 mg) | 6 ml (500 mg) | 9 ml (750 mg) |
| Modification | 3 ml (250 mg) | 3 ml (250 mg) | 3 ml (250 mg) |

If gamma globulin is unobtainable convalescent serum (preferably from a single donor) may be used It should be given from the first to fifth day after exposure in doses of 0 3 ml per pound (0 6 ml per Kg approx ) body weight (for prevention) or 0 1 ml per pound (0 2 ml per Kg approx ) body weight (for modification) The use of pooled adult serum should be abandoned because of the risk of serum hepatitis If preventive doses are given admissions and discharges can go on as before

**Mumps** —The primary case should be sent home or to the isolation hospital Nothing need be done for fourteen days and then if there are susceptible children left the

ward *should* be closed for a week The children should be watched for early symptoms The likelihood of cases developing after the twenty first day is very slight Only children who are definitely known to have had mumps should be admitted during the period of surveillance

**Rubella** —This *is not highly infectious and secondary* cases are not inevitable Hence when the primary case *has been disposed of surveillance only should be* practised A child should not be sent home if his mother is in the early stages of pregnancy (*i e* up to the end of the fourth month)

**Diphtheria** —The patient should be isolated—usually in the infectious diseases hospital All contacts (patients and staff) should be questioned about immunisation and their *throats and noses should be swabbed Those who are* positive should be isolated and the others should be *carefully watched Un immunised children and staff with* negative swabs may be given passive immunity (which lasts fourteen to twenty-one days) by antitoxin (2 000 to 4 000 units intramuscularly) Active immunisation should also be started

**Scarlet fever** —The case should be sent home or to the isolation hospital or to a separate room and treated with penicillin Scarlet fever is usually mild and uncompli cated but it should not be regarded lightly in a surgical *or maternity ward Throat swabs should be taken from* the remaining patients and staff and those who show *haemolytic streptococci or who have symptoms should be* isolated and given penicillin This eliminates the strepto cocci in four or five days *and drug resistance does not* develop The ward need not be closed for admissions because of a single case *but* closure may be necessary for a few days if further cases occur

**Chicken pox** —The child should be sent home or to an isolation hospital Chicken pox is very infectious and as cases are not usually diagnosed in the early stages secondary cases can be expected A history of chicken pox should be regarded as doubtful if careful search does not show any pock marks If susceptible children are left in the ward only patients who give a definite past history of chicken pox should be admitted for twenty-one days —the quarantine period An adult with herpes zoster may give rise to chicken pox in child contacts

**Smallpox** —If this is suspected ring up the Medical Officer of Health and act on his instructions

**Whooping cough** —The case (suspected because of a spasmodic cough and a lymphocytosis or proved by a per nasal swab (*see page* 50) should be sent home or to the isolation hospital Further cases will not occur until the end of the incubation period—say in seventeen days Hence admission of children with a definite past history of whooping cough can go on for the first ten days Children in the ward who have not had whooping cough may be given gamma globulin as a prophylactic in doses double those recommended for measles Admissions should cease from the tenth to twenty first day after the case has been received and the remaining children should be carefully watched

**Sonne dysentery** —The patient should be sent to the isolation hospital or isolated under strict barrier nursing precautions until several consecutive stool cultures are negative Rectal swabs or preferably stools of all con tacts should be examined Members of the staff must report any diarrhoea Admissions need not be restricted

## TABLE SHOWING INCUBATION, INFECTIVITY AND QUARANTINE

| | INCUBATION in days | INFECTIVITY | QUARANTINE in days |
|---|---|---|---|
| Chicken pox | Extremes 10 to 16<br>Commonest 14 | Until all scabs are off | 21 |
| Diphtheria | 2 to 10 | Until two consecutive nose and throat swabs are negative | 7 |
| Measles | 7 to 14<br>Normally Koplik's spots on the 9th day and rash on the 1 th day | 14 days from the appearance of the rash or in mild attacks until the end of clinical symptoms | 21 |
| Rubella | 5 to 21 | 7 days from the appearance of the rash | 21 |
| Mumps | Extremes 10 to 28<br>Commonest 17 | 1 week after glands subside | 28 |
| Whooping cough | 14 to 16 | 21 days or until all catarrh has gone | 14 |

## MILESTONES IN INFANT DEVELOPMENT

A baby doubles his birth weight (7 lb) in 6 months (14 lb) and trebles it (21 lb) by the end of his first year For the next three years he gains about 5 lb a year

Rate of increase of weight is 6 oz a week in the first 6 months and 3 oz a week in the second 6 months

*Teeth* —Lower central incisors appear at 6 to 9 months All milk teeth (20) are present at $2^1/_2$ years Permanent teeth (32) begin to appear at 6 years—(molars first) and all are erupted (except wisdoms) at 12 years

*Anterior fontanelle* should be closed at 18 months

*Circumference of head*—$13^1/$ inches at birth 18 inches at 1 year For intermediate ages *see table*

*Progress* —An infant

| | |
|---|---|
| Holds up his head | at 3 months |
| Sits up | at 6 months |
| Crawls | at 9 months |
| Stands | at 12 months |
| Walks | at 12 to 15 months |
| Says words | at 1 year |
| Says sentences | at 2 years |

## CENTRES OF OSSIFICATION IN THE WRIST

| | |
|---|---|
| At birth | entirely cartilaginous |
| 6 months | 1 centre |
| 1 year | 2 centres |
| 3 years | 3 centres |
| 4 / years | 4 centres |
| 5 years | 5 centres |
| 6 years | 6 centres |
| 7 years | 7 centres |
| 12 years | 8 centres |

The lower radial epiphysis begins to ossify at 21 months and the lower ulnar epiphysis at 7 years

## WEIGHT AND CIRCUMFERENCE OF HEAD OF INFANTS

| | *Weight in lb* | | *Head Circumference in inches* | |
|---|---|---|---|---|
| AGE | BOYS | GIRLS | BOYS | GIRLS |
| Birth | 7·55 | 7·16 | 13·9 | 13·5 |
| 6 months | 16·0 | 15·5 | 17·0 | 16·6 |
| 12 months | 20·5 | 19·8 | 18·0 | 17·6 |
| 18 months | 22·8 | 22·0 | 18·5 | 18·0 |
| 2 years | 26·5 | 25·5 | 18·9 | 18·6 |
| 3 years | 31·2 | 30·0 | 19·3 | 19·0 |
| 4 years | 35·0 | 34·0 | 19·7 | 19·5 |
| 5 years | 41·2 | 39·8 | 20·5 | 20·2 |
| 6 years | 45·1 | 43·8 | | |
| 7 years | 49·5 | 48·0 | | |
| 8 years | 54·5 | 52·9 | | |
| 9 years | 60·0 | 57·5 | | |
| 10 years | 66·6 | 64·1 | 21·0 | 0·7 |
| 11 years | 72·4 | 70·3 | | |
| 12 years | 79·8 | 81·4 | | |

For conversion factors to Metric System *see page* 33

## INFANT FEEDING

The fluid requirements of an infant are $2^1/_2$ fl oz per lb body weight in each twenty four hours

The calorie requirements are 45 to 50 per lb in each twenty four hours The feeds should be based on the *expected* body weight for the age but the amount can only be reached gradually if the infant is much under weight

The calorie value of both breast milk and cow s milk (raw or dried and reconstituted) is 20 calories per fl oz

From these simple facts the sufficiency of an infant s diet can be easily calculated

The calorie value of 1 fl oz of some milk foods is as follows They are all reconstituted 1 in 8 (*i e* 1 measure of powder to 8 measures (=1 fl oz) of water) except when otherwise stated

*National Dried Milk* —Full cream 18 Half cream 14

*Cow and Gate Products* —Full cream and Full cream Lacidac 18 4 Half cream and Half cream Lacidac 14 3 Separated milk food and Lacidac separated (both 1 in 10) 10 4 Humanised 18 Frailac (1 in 10) 18 Allergilac 17 Prolac (1 in 12) 11 2 Sprulac 15

*Trufood products* —Full cream 18 5 Half cream 15 75 Humanised 18 Lactogen 18 4

*Ideal Milk* —60 calories per fl oz (*i e* 1 in 3 dilution yields 20 calories per fl oz)

*Nestles Milk* —100 calories per fl oz (*i e* 1 in 5 dilution yields 20 calories per fl oz)

*Bone and vegetable soup* —13 calories per fl oz

## CHAPTER II

# *Clinical Procedures*

### CATHETERISATION

**Men**—It is best to put a rubber sheet under the patient first. Having scrubbed the hands thoroughly retract the prepuce if necessary and clean the glans with 1 in 1 000 cetrimide. Then wash the hands again. Lubricate the catheter with sterile lubricant and pass it into the meatus and gently on into the bladder. Collect the urine in a dish or bottle.

If need be a sedative such as amylobarbitone 60 mg (1 gr) by mouth or even morphine 15 mg (gr 1/4) by injection may be given beforehand.

When catheterisation is painful 5 ml of 1 per cent amethocaine may be injected into the urethra and kept there for ten minutes by a penile clip. A special glass syringe which fits the meatus tightly and a rubber bulb must be used. The solution should be massaged into the posterior urethra before the clip is removed. It is best not to use a local anaesthetic after bleeding has occurred.

Catheterisation in men is done to relieve retention. If uncontaminated urine is all that is wanted then a mid stream specimen is satisfactory. The glans and meatus are cleaned. Some urine is passed and discarded and then the rest passed straight into a sterile bottle.

**Women**—In a good light clean the labia majora by swabbing from before backwards with 1 in 1 000 cetrimide. Then separate the labia minora with the left thumb

and index finger and clean with a swab With a third swab clean the region of the meatus and leave this swab in place Wash the hands and then holding the lubricated catheter near its tip introduce it into the urethra Urine flows immediately and should be collected in a sterile bottle Unless the meatus is clearly seen it is easy to make the mistake of passing the catheter into the vagina

## Removal of Ascitic Fluid

Give a sedative if the patient is anxious (*e g* amylo barbitone 100 mg (gr 1½) Make sure that the bladder is emptied Put a many tail bandage or binder under the patient The puncture site may be in the mid line between the umbilicus and the symphysis pubis or just above McBurney s point (midway between the anterior superior iliac spine and the umbilicus) Cleanse the skin and put sterile towels over the abdomen Infiltrate the puncture site with 2 per cent procaine Make a tiny nick with a scalpel and push in the trocar and cannula It is more comfortable if the cannula is removed after threading fine plastic tubing through it When Southey s cannula is used don t forget the little silver guard The fine tubing is attached to the cannula and the sharp trocar pushed through the rubber into it Remove the fluid slowly into a Winchester bottle and tighten the bandage as it drains Inject 500 000 units of penicillin dissolved in 2 ml of physiological saline down the cannula before removal Seal the puncture with collodion and a dressing Send two samples of fluid to the laboratory (or all of it if requested) One sample should have citrate added to it If there is doubt as to whether the fluid removed is ascitic fluid or urine have its urea content estimated Urine contains

## CHAPTER II

# *Clinical Procedures*

### CATHETERISATION

**Men** —It is best to put a rubber sheet under the patient first Having scrubbed the hands thoroughly retract the prepuce if necessary and clean the glans with 1 in 1 000 cetrimide Then wash the hands again Lubricate the catheter with sterile lubricant and pass it into the meatus and gently on into the bladder Collect the urine in a dish or bottle

If need be a sedative such as amylobarbitone 60 mg (1 gr) by mouth or even morphine 15 mg (gr ¼) by injection may be given beforehand

When catheterisation is painful 5 ml of 1 per cent amethocaine may be injected into the urethra and kept there for ten minutes by a penile clip A special glass syringe which fits the meatus tightly and a rubber bulb must be used The solution should be massaged into the posterior urethra before the clip is removed It is best not to use a local anaesthetic after bleeding has occurred

Catheterisation in men is done to relieve retention If uncontaminated urine is all that is wanted then a mid stream specimen is satisfactory The glans and meatus are cleaned Some urine is passed and discarded and then the rest passed straight into a sterile bottle

**Women** —In a good light clean the labia majora by swabbing from before backwards with 1 in 1 000 cetrimide Then separate the labia minora with the left thumb

X ray examination will often help greatly but the best evidence of fluid is to obtain it by needling Put a pillow on a bed table and let the patient sit up and rest his arms on it He may need support also Most patients do not need premedication The usual site for puncture is in the eighth or ninth space between the scapular and posterior axillary lines Try to choose a place where dullness is marked and where there is a characteristic feel in the intercostal space Raise a wheal with 2 per cent procaine and then infiltrate down to the pleura Try to avoid the lower edge of the upper rib where the intercostal vessels are Use a large needle attached to a 20 ml syringe to penetrate the pleura and always make sure it is not blocked before use Withdraw fluid and put some in a plain tube (for culture) and some in a citrate tube (for cytological examination) Seal the puncture site with collodion or similar preparation

If a broncho pleural fistula is suspected inject 5 to 10 ml of methylene blue into the pus Blue sputum sub sequently indicates a fistula

**Pleural aspiration** —This is done in the same way as pleural exploration but a 50 ml syringe and two way tap are used Be prepared to spend considerable time in taking off the fluid but desist when coughing is trouble some or faintness comes on (If the latter seems serious treat as for air embolism—*see page* 152)

When a massive effusion causing dyspnoea and gross mediastinal displacement calls for removal of much fluid then it is sometimes an advantage to remove the first 400 ml or so quickly by a Potain s aspirator A bottle which can be evacuated by a hand pump is connected to the needle in the chest Practise with it first so as to be sure that it is not wrongly connected or else you may

about 2,000 mg of urea per 100 ml whereas ascitic fluid contains only about 30 mg per 100 ml

## Removal of Oedema Fluid

This is occasionally necessary when mersalyl and Diamox are not sufficiently effective

The patient should be nursed for several days in a cardiac bed with the legs low This ensures that as much oedema fluid as possible is drained into the legs A plastic sheet is arranged so as to divert fluid into a large bowl The skin is cleaned with 1 in 1 000 cetrimide and then smeared with Lassar s paste or penicillin cream

Infiltrate about ten or a dozen places on the dorsum of the foot and inner aspect of the leg below the knee with 2 per cent procaine and insert wide bore serum needles into each for an inch or so Fluid should be allowed to emerge for several days Then the paste is cleaned off and the punctures sealed with collodion The legs should be raised for twenty four hours or so after wards Alternatively five or six Southey s tubes may be inserted in a similar way and connected by fine rubber tubing to a bottle

## Needling the Pleura

The house physician will often have to introduce a needle into the pleura (1) to search for pus or fluid and (2) to remove fluid known to be present

**Pleural exploration** —Stony dullness silence on auscul tation and cardiac displacement are the best physical signs of fluid but solid lung with blocked bronchi may produce signs resembling fluid and fluid under pressure which compresses normal lung may mimic consolidation

the blood may be put into a bijou bottle so as to fill it and then centrifuged for an hour The plasma is then drawn off and placed in the refrigerator if not used at once

## Blood Culture

Try to take blood at a time when the temperature is rising or at the onset of a rigor Cleanse the forearm thoroughly with soap and water 70 per cent alcohol and ether Using a dry sterile syringe take 20 ml. of blood from a vein Unscrew the cap from a bottle of *glucose broth (preferably kept until use at incubator* temperature) add the blood and quickly replace the cap Label the bottle and put it in an incubator without delay When certain infections are suspected special media are used *e g* heart brain broth for anaerobes and bile salt broth for intestinal organisms The pathologist should be consulted about these

## Circulation Time

**Arm to tongue**—The patient should be lying down with his arm on a pillow so that it is at the same level as his heart Into an elbow vein inject a solution of 2 4 G saccharine in 4 ml of Water for Injection The nurse should start the watch as soon as you begin the injection and stop it as soon as the patient indicates that he tastes the saccharine The normal time is ten to seventeen seconds It is increased in left ventricular failure ( cardiac asthma ) whereas it is normal in true or bronchial asthma

**Arm to lung**—This is performed in the same way using 0 3 ml (5 minims) of ether in 0 3 ml (5 minims) of physiological saline The patient shows the end point

introduce air under pressure into the chest As you may wish to continue with a syringe and two way tap arrange your needle adaptors carefully first

Replacement of fluid by air will often allow aspiration to go on longer than would be possible otherwise because the lung is prevented from expanding too quickly A few syringefuls of air (but fewer in number than the syringe fuls of fluid removed) are injected with the aspirating syringe If a large amount of air is replaced it is well to put a second needle into the air pocket and connect to a pneumothorax apparatus The amount of air should be adjusted so as to leave the pressure slightly negative If there is any question of a broncho-pleural fistula always X ray the chest before needling You can then be certain that any gas in the pleura was not artificially introduced

### Arterial Puncture

With the elbow extended determine the course of the brachial artery by palpation as it lies on the inner side of the lower end of the humerus Raise a wheal over it with 2 per cent procaine and infiltrate the tissues down to the artery Using a serum needle and an all glass syringe introduce the needle at an angle of 45 degrees and approach the artery Keep the left index finger over the artery just above where it is to be punctured When the needle touches the artery wall pulsations are transmitted to it and when the lumen is entered blood rises easily into the syringe without the need to pull on the piston Remove 8 to 10 ml of blood The nurse or the patient himself should press on the artery for five minutes Remove the needle from the syringe and expel any air bubbles Draw up a little mercury to act as a seal and then plug the nozzle with a match stick Alternatively

120 near the end The swab is moistened with sterile water and passed carefully over the back of the tongue without touching anything until it is at the glottis The patient then coughs violently and the swab is withdrawn and placed in its tube It is wise to wear a mask yourself while doing this

### PREPARATION FOR GASTROSCOPY

*The patient must not take any food or drink after* supper Next morning about $1^1/_4$ hours before the examination he is given morphine 15 mg (gr $^1/$ ) and hyoscine 0 5 mg (approx gr $^1/$ ) subcutaneously (Women should have morphine 10 mg (gr $^1/_6$) and hyoscine 0 4 mg (gr $^1/_{1\,0}$) Five minutes before the examination he gargles with 2 ml of 2 per cent Butacaine Sulphate B P C (Butyn Abbott) and swallows it

The house physician should send a list of patients for gastroscopy to the theatre Patients should be reassured that gastroscopy is not an operation and that the examination only lasts five or ten minutes When there is gastric retention preliminary gastric lavage is useful A Senoran s evacuator should be ready in case fluid has to be removed in the theatre No special measures are needed after examination beyond avoidance of hot drinks for some hours If there is undue dysphagia an oesophageal tear may be suspected (about 1 in 1 000 cases and usually in elderly women) The neck should be palpated for subcutaneous emphysema

### LIVER BIOPSY

Have the patient s prothrombin activity estimated and give vitamin $K_1$ (Konakion Roche) 10 mg in fruit juice by mouth if it is low Defer the operation until it is

by signalling or coughing The normal time is four to eight seconds It is increased in congestive cardiac failure and decreased if the cardiac output is high as in anaemia emphysema and thyrotoxicosis

### Vaginal Trichomoniasis

Vaginal swabs are not very satisfactory It is better to put the patient in the lithotomy position and insert a speculum 2 or 3 ml of physiological saline are then washed in and out of the vagina with a teat pipette a few times and the fluid put in a test tube

### Threadworms

When the question of threadworm infestation arises the diagnosis is most conveniently made by a search for eggs on adhesive cellophane tape Preferably before a morning bath or bowel action apply a narrow strip of the tape along the anal margin and press it against the skin with the end of a test tube Then place it firmly on a clean glass slide and send it to the laboratory It can be examined for clumps of eggs without further preparation

### Per nasal Swabs (for whooping cough)

These are of cotton wool on long straight pieces of wire The swab is pushed horizontally backwards through one or other nostril until it impinges on the posterior pharyngeal wall and then withdrawn and placed in its tube This method is more likely to give a positive result than is the use of a cough plate

### Laryngeal Swabs (for tuberculosis)

The swab is a 9 in piece of wire with cotton wool firmly wrapped round the end It is bent to an angle of

eight hours or 400 mg of a gelatin dextrose preparation (Heparin Retard) intramuscularly every twenty four to forty-eight hours Estimate the coagulation time before the next injection and aim at a dose which doubles or trebles it Overdosage can be quickly reversed by protamine sulphate 5 mg per Kg body weight intravenously

**Phenindione (Dindevan)** —This acts in twenty four to thirty six hours after a loading dose 150 to 200 mg by mouth Usually prothrombin activity between 20 to 30 per cent of normal can be maintained on doses of 50 mg twice a day Overdosage can be corrected by transfusion of fresh blood or vitamin $K_1$ (Konakion Roche) 10 mg by mouth

### Prothrombin Activity

When a patient is having anti-coagulant therapy the house physician may have to take the blood for estimation of its prothrombin activity The blood must be treated with a known amount of oxalate A special tube is issued by the laboratory containing exactly 0 25 ml of $\frac{M}{10}$ sodium oxalate (1 34 G in 100 ml) Blood is then added up to the level of 2 5 ml The blood and oxalate are thoroughly mixed and the tubes sent to the laboratory

### Oxygen Therapy

Normal capacity of cylinders is 24 48 120 and 180 cubic feet To work out how long a cylinder will last remember that there are 28 3 litres to a cubic foot If F equals the number of cubic feet in the cylinder and M

normal (Vitamin K analogues such as Synkavit Roche 10 mg intramuscularly are less effective)

Have the patient s blood group determined in case of need If ascites is present this should be tapped first Premedication is advisable with morphine 15 mg (gr 1/4) an hour before the biopsy The operator will use a special syringe and needle The patient will have to hold his breath at the end of expiration if the puncture is done through an intercostal space If he breathes the liver may be torn So it is well to get him to practise first according to the instructions Breathe in breathe out hold your breath If the liver is enlarged the puncture may be made through the abdominal wall The breath should then be held at the height of inspiration

### Electroencephalography

Make an appointment in the department or at the hospital concerned and see that the patient presents himself at the appointed time having had no food or drink for the previous four hours Phenytoin (Epanutin) should be discontinued for forty-eight hours beforehand but phenobarbitone need not be omitted

### Electrocardiography

Ask the electrocardiographer to show you how to make a record in case of need When sending a patient always provide information on the following points —Heart rate and rhythm blood pressure whether having digitalis or not and for how long

### Anti Coagulant Therapy

**Heparin**—For immediate action use heparin—adult dose 100 mg (10 000 units) intravenously every six to

to the skin through the lymph about thirty times There should be no movement of the needle in its long axis No bleeding should occur No dressing is necessary until a vesicle forms but it should certainly be applied then in children lest they scratch the site and then inoculate their eyes by rubbing them with contaminated fingers For the same reason it is wise in children to wipe off excess lymph

*To eject lymph don t blow down the capillary tube itself* Push the tube through a needle puncture in the end of a pipette bulb or the hole in the teat of a baby s bottle until it projects from the open end Break off this end and pull the tube back by the intact end until only a little of the tube remains in the bulb Break off this intact end and connect the bulb to a length of glass tubing with a cotton wool plug in it You may blow down this tube with safety The lymph can be ejected drop by drop and there is no back suction Alternatively the lymph can be ejected by connecting the capillary tube to a teat pipette by an inch or so of fine rubber tubing

For certification purposes the description of the result must be precise The international certificate simply requires the doctor to say whether vaccination was primary or a re vaccination and if primary whether it was successful Other certificates (*e g* for local auth orities) ask for the type of result This may be —

1 Typical primary vaccinia The reaction begins on the third or fourth day and by the seventh to tenth day there is a vesicle with surrounding red induration

2 Accelerated or vaccinoid reaction This appears on the fifth to seventh day and is like primary vaccinia but smaller It indicates that the patient has partial immunity

equals the number of litres per minute of flow then the cylinder will last $\frac{F}{2M}$ hours Since oxygen does not liquefy at the pressure in cylinders (1 800 lb per sq inch or 120 atmospheres) the volume of gas in the cylinder is proportional to the pressure and the pressure gauge is used to tell gas content (This is not the case with gases like nitrous oxide which easily liquefy)

**Warning** —Oil and grease must not be used on oxygen taps and valves Electrical apparatus of all kinds and anything liable to spark must be kept well away from the oxygen tent Smoking and the use of matches and lighters must be absolutely forbidden near an oxygen tent or mask when in use *The house physician should satisfy himself that these points are clearly understood by all who use oxygen*

### VACCINATION

Order vaccine lymph in advance from the dispensary or from one of the laboratories of the Public Health Laboratory Service It will remain potent for at least six months if kept below freezing point and for fourteen days at 0 C to 10 C (*i e* in a domestic refrigerator) It loses potency in two or three days at room temperature

*Technique* —The multiple pressure method is best using a single site but in an epidemic two areas separated by about an inch should be vaccinated Cleanse (but do not irritate) the skin with ether and place on it a drop of lymph Grip the patient s upper arm with the left hand to render the skin taut Smear the lymph over an area the size of sixpence with a darning needle and through this area perform a shallow tangential pricking with the needle held parallel to the skin and crosswise to the arm The side of the needle point must be pressed firmly on

to the skin through the lymph about thirty times There should be no movement of the needle in its long axis No bleeding should occur No dressing is necessary until a vesicle forms but it should certainly be applied then in children lest they scratch the site and then inoculate their eyes by rubbing them with contaminated fingers For the same reason it is wise in children to wipe off excess lymph

To eject lymph don t blow down the capillary tube itself Push the tube through a needle puncture in the end of a pipette bulb or the hole in the teat of a baby s bottle until it projects from the open end Break off this end and pull the tube back by the intact end until only a little of the tube remains in the bulb Break off this intact end and connect the bulb to a length of glass tubing with a cotton wool plug in it You may blow down this tube with safety The lymph can be ejected drop by drop and there is no back suction Alternatively the lymph can be ejected by connecting the capillary tube to a teat pipette by an inch or so of fine rubber tubing

For certification purposes the description of the result must be precise The international certificate simply requires the doctor to say whether vaccination was primary or a re vaccination and if primary whether it was successful Other certificates (*e g* for local authorities) ask for the type of result This may be —

1 Typical primary vaccinia The reaction begins on the third or fourth day and by the seventh to tenth day there is a vesicle with surrounding red induration
2 Accelerated or vaccinoid reaction This appears on the fifth to seventh day and is like primary vaccinia but smaller It indicates that the patient has partial immunity

3 Maximum local reaction This occurs in persons with a high degree of immunity Redness appears on the second or third day but there is no vesicle or induration

4 No local reaction

3 and 4 indicate immunity if the lymph was potent but it will save misunderstanding if 3 and 4 are both recorded as Reaction of Immunity For the same reason in recording the date Arabic numerals should be used for the day and year and Roman numerals for the month Thus 10 Aug 1954 would be 10 VIII 1954

*Successful vaccination in the first six days of the incubation period will probably prevent smallpox in the next three days it will modify the attack but after the ninth day it will be ineffective*

Should a person flatly refuse urgent vaccination during an epidemic he might be given immune globulin active *against the variola virus if any should be available at the* Central Public Health Laboratory Colindale Avenue London N W 9 Tel Colindale 7041

## Blood Transfusions

The house physician should read carefully the Notes on Transfusion provided for him by the Ministry of Health Accidents are more often due to clerical than to technical errors So be very careful in filling up the forms

Except in an emergency it is better for all blood grouping and cross matching to be done unhurriedly by a pathologist or technician experienced in the method and familiar with the many difficulties which may arise Only the techniques of rapid grouping of O s and A s and of cross matching are therefore described here since they

are really all that the house physician should undertake and then only exceptionally

**Rapid grouping of O's and A's**—As group O ( universal donor ) Rh negative blood is in short supply and may be harmful to some patients the practice of giving it in all emergencies is not desirable A simple rapid method of deciding whether a patient can be given A Rh negative or O Rh negative blood has been described by Dr R A Zeitlin Slides are provided coated with potent anti A serum and protected by polythene adhesive They remain active at refrigerator temperature for three months One drop of the recipient s blood and one drop of water are mixed on the slide If the patient s group is A or AB macroscopic agglutination can be seen within a minute *Such a patient can be given A Rh negative blood* If there is no agglutination the patient belongs to group O or B and may be given O Rh negative blood

**Cross matching**—The recipient s serum is matched against the donor s cells suspended both in saline at room temperature and in 20 per cent albumin at 37 C (to detect immune anti bodies) The donor s serum is similarly tested against the recipient s cells

The following tubes must be prepared and all carefully labelled with a grease pencil

1 **Recipient's serum**—This is obtained by taking 5 ml of blood from the recipient and allowing it to clot The serum should be centrifuged to clear it of red cells The serum is removed by a teat pipette

2 **Recipient s cells in saline**—Two or three drops of the recipient s blood are put into a tube of saline

3 **Recipient's cells washed and resuspended in saline** — A tube prepared as in 2 is centrifuged and the fluid poured off and more saline added

4 **Donor's plasma** —This is obtained by centrifuging some blood from the bottle

5 **Donor's cells in saline** —This is prepared as in 2 using blood from the donor's finger or from the bottle

6 **Donor's cells washed and resuspended in saline** —This *is prepared as in 3*

For each cross matching four agglutination tubes must be set up in wooden racks as shown So that the volumes *of all shall be about the same a drop of saline is put in* the saline tubes to take the place of the drop of albumin in the albumin tubes Each tube therefore contains three *drops as follows* —

| | *1 drop each of* | |
|---|---|---|
| TUBE 1 | Washed donor's cells in saline<br>Recipient's serum<br>Saline | These saline tubes covered and kept at room temperature for 2 hours |
| TUBE 2 | Washed recipient's cells in saline<br>*Donor's serum*<br>Saline | |
| TUBE 3 | Washed donor's cells in saline<br>Recipient's serum<br>*20 per cent albumin* | *These albumin* tubes in incubator at 37 C for hours |
| TUBE 4 | Washed recipient's cells in saline<br>Donor's serum<br>20 per cent albumin | |

After two hours a drop from each tube is removed with a teat pipette and spread on a slide and examined under a low power for agglutination In an urgent case the reading can be made after fifteen minutes incubation and

centrifuging at 1 000 revolutions for one minute If rouleaux formation is suspected a drop of saline added to the tube may help to facilitate reading

**Special precautions to be observed in using blood for transfusion**

1 Checking of blood bottles
   Before connecting *each* bottle to the patient check carefully the following points —
   (*a*) That the full name age and ward on the cross match label are those of the patient
   (*b*) That the numbers on the bottle and cross match label are the same
   (*c*) That the expiry date has not been reached
   (*d*) That the blood group on the cross match label is the same as that recorded in the patient s notes
2 If a pilot bottle is provided use this to obtain blood for testing rather than open the blood bottle itself
3 Do not warm blood before use
4 Return the used blood bottle unwashed to the laboratory

### Blood Transfusion in Babies

*How much?*—An infant s blood volume is 40 ml per pound Hence if an 8 lb baby (blood volume 320 ml ) has Hb 60 per cent a rise of 40 per cent will call for $^{40}/_{100} \times 320 = 128$ ml of blood (*Note* Bottled blood is about one fifth citrate)

*How fast?*—30 to 40 ml per hour is safe *i e* 1 drop every five seconds

Since 1 drop = $^{1}/_{20}$ ml at 1 drop per second (60 drops or 3 ml per minute) he will get 180 ml per hour One fifth of this rate is 36 ml per hour

A useful rule for infants is that the normal requirement of 2½ fl oz per pound per twenty four hours will be achieved if the number of drops per minute equals the weight in pounds

### Blood Transfusion Reactions

These are mostly **non specific** chills and rigors and result from haemolysed blood foreign matter from new tubing or too rapid transfusion Intense backache so characteristic of incompatible transfusion does not occur If slowing down the transfusion does not bring improvement the blood bottle should be changed Should the house physician witness the now very rare **true transfusion reaction** from incompatible blood characterised by shock back pain and tightness in the chest the transfusion should be stopped at once All measures to keep up the blood pressure and prevent renal failure should be adopted A transfusion of compatible blood is valuable Measure the urinary output carefully If this is low put the patient on an electrolyte free gastric drip (400 G glucose and 100 G peanut oil) in 1 litre of water (with sufficient acacia to emulsify the oil) every twenty four hours

Always send the discarded blood to the laboratory

**Circulatory overloading** from too rapid transfusion of too much blood in a patient with a failing heart causes cough frothy sputum dyspnoea and basal rales Stop the transfusion Remove blood or apply tourniquets to the legs and give morphine and oxygen

### Lumbar Puncture

The house physician will have ample opportunity to become skilled in this operation

Put the patient on his left side with his left buttock and shoulder on the hard edge of the bed Fracture boards may be needed The long axis of the spine must be horizontal and the plane of the iliac crests vertical The spine must be fully flexed These details about the patient s position are most important Raise a wheal with 2 per cent procaine at the point of entry This is where the plane of the highest points of the iliac crests crosses the mid line (It is between the spines of the 3rd and 4th lumbar vertebrae) Use dry hands and needle Direct the needle so that while in the horizontal plane it is inclined about 5 degrees towards the head—so that it is parallel to the slope of the vertebral spines The ligamentum flavum should be pierced with the bevel in the spinal axis so as to separate rather than cut across the fibres Withdraw the stilette and fluid should flow The first few drops may be discarded as they often contain red blood cells Take the specimen into a plain bottle but if it is cloudy a little should be taken into a citrate bottle also

Avoid lumbar puncture if there is papilloedema and also if the skin of the back is infected If it has to be done when raised intracranial pressure is suspected use a fine needle and take very little fluid

**Difficulties**

1 No fluid flows Advance the needle a little and rotate it

2 Bone is encountered Withdraw the needle and correct the patient s position — generally by increasing flexion

3 Blood appears If only a drop and then nothing more the needle is only in the subdural space Advance

it a little If the fluid is bloodstained it means trauma ('*bloody tap*') *or subarachnoid haemorrhage*

Traumatic bleeding clears as fluid drains If in doubt take it into three numbered tubes A diminishing blood count in each indicates traumatic blood This frequently clots and leaves clear fluid In subarachnoid haemorrhage clotting does not occur and the fluid is yellow (a simpler word than 'xanthochromic')

**C S F pressure**—Using one of the types of manometer note the resting pressure and the response to coughing Compress the R and L jugular veins separately and then together and note the effect The patient should be breathing easily and not holding his breath as $CO_2$ retention raises C S F pressure

## CHAPTER III

# *Clinical Pathology*

Amongst the following are some simple laboratory investigations which the house physician could reasonably be expected to perform if occasion arose In all of them he should be fully aware of the principles concerned

### How to Send Specimens for Laboratory Tests

Although in most hospitals many specimens are collected by technicians and sometimes by nurses (*see page* 25) the house physician should know what kind of specimen is needed for which test and why If you are not sure what to send always ask the laboratory first Blood should be taken with dry sterilised syringes The needle should be detached and the bottle cap removed before injecting the blood into the bottle If a syringe has been boiled it should be rinsed with sterile physiological saline

Use **plain bottles,** in which blood can clot for

- All agglutination tests
- The Paul Bunnell test for glandular fever
- Cold agglutinins
- Wassermann and Kahn tests
- Gonococcal complement fixation test
- Cross matching (also send 1 ml of blood in a heparin bottle)
- Sodium
- Potassium

Use **Oxalate bottle** for
- Blood urea (shake gently)
- Prothrombin

Use **heparin bottle** (shake gently) for
- Sodium and Potassium by flame photometer Bromides Calcium Chlorides Cholesterol Diastase Lipase
- Liver function tests (also send at least 1 ml of blood in a plain bottle)
- Acid and alkaline phosphatase
- Phosphorus (send to laboratory at once)
- Proteins Salicylates
- Sedimentation rate Uric acid
- Van den Bergh reaction (send to laboratory at once)

Use **fluoride oxalate bottle** for
- Sugar (shake gently) (state the time of the last meal)

Use **Citrate bottle** for
- Pleural fluid
- Ascitic fluid
- All fluids for cytological examination and culture

**Blood gases** —When blood is taken for oxygen or $CO_2$ content contact between the specimen and the air must be carefully avoided A small amount of heparin solution is used to moisten the syringe before taking up the blood The needle is detached and any air bubbles are expelled A little mercury is drawn up from a watch glass to help in mixing the blood and to seal the nozzle This is closed by a match stick and the syringe is sent to the laboratory where it is kept in the refrigerator

**Stools for amoebae** —The specimen must be fresh Any portion containing mucus should be sent It must be kept warm

**Stools for steatorrhoea**—(*see page* 77)

**Reticulocytes**—use a special slide covered with dye

**Urine for lead** —Send a twenty four hour specimen in a chemically clean bottle obtained specially from the laboratory (*see page* 69)

## SPARE THE PATHOLOGIST !

**Request forms** —Be specific in your requests For example don t ask for a Full blood count when all you really need is a haemoglobin estimation Give the path ologist the clinical details he wants He will then be able to interpret his findings for you Don t request elaborate investigations without consulting the pathologist first

**Haematological investigations** —A Hb estimation and an expert examination of a blood film are the basic inves tigations and will often yield all the information needed Don t ask for *platelet counts* until a film has been examined for them Unless the platelets are reduced there is little point in estimating the *bleeding time* The *clotting time* is rarely prolonged except in haemophilia so don t ask for it in elderly women who are much more likely to have senile purpura

**Bacteriological investigations** —Don t let swabs dry but send them to the laboratory (or refrigerator) promptly The laboratory should be warned beforehand if swabs for gonococci are contemplated Try to be sure that a specimen of sputum will not be saliva and will not be mixed with antiseptic Leaking specimen pots are dangerous and will probably be destroyed unexamined

**Specimens for histology** —If you assist at an operation and are asked whether a specimen should be kept *always*

*say Yes* Leave it to the pathologist to refuse it and also to cut it up

### PATHOLOGICAL SPECIMENS BY POST

The house physician may sometimes have to send a specimen by post to another hospital It must be sent by letter post and on no account by parcel post It should be surrounded by sufficient wool or sawdust to absorb any spilled fluid and must be marked 'Fragile With Care and Pathological Specimen Otherwise the parcel may be stopped and destroyed

Bottles containing preservative should be used for any blood specimens sent by post Fluoride-oxalate bottles may be used for blood for sugar estimations Bottles containing streptomycin (1 mg in a solution and dried for a bottle taking 10 ml of blood) are used when haemoglobin estimation and (with oxalate also) when urea estimation is wanted

### OBTAINING BLOOD FROM A SMALL CHILD

**From the heel**—Warm the foot by immersing it in warm water for two minutes Rub the heel with alcohol and quickly dry it Then apply a thin layer of petroleum jelly (this facilitates the formation of discrete drops of blood) Grasp the foot firmly so that the heel projects between the thumb and index finger Puncture the heel deeply with a triangular needle Collect the blood with a Pasteur teat pipette and eject it into a tube Between each drawing up of blood the grip should be completely relaxed Rinse the pipette with physiological saline from time to time to clear any small clots Alternatively the blood may be simply allowed to drip into a small tube

**From the external jugular vein** —The nurse holds the child wrapped firmly in a blanket on her lap so that he faces her with his head on her knees She compresses the vein just above the clavicle and turns the head to the opposite side Then insert the needle towards the thorax where the vein crosses the sterno mastoid muscle

ERYTHROCYTE SEDIMENTATION RATE (E S R)

The methods of Wintrobe (using undiluted heparinised blood) and Westergren (using blood diluted with citrate solution) do not always agree If one test does not seem to fit in with the clinical findings both should be per formed

**Wintrobe's method** —Take a few ml of venous blood with a dry syringe and put in a heparin bottle Using a new Pasteur pipette fill a Wintrobe tube from the bottom upwards to the 10 mark (Tubes are numbered in case several tests are being done) Avoid bubbles Set the tube in a special stand and adjust the screw feet until the spirit level shows the tube to be vertical This is very important Set the clock to ring in one hour and then read the length of the column of plasma *i e* from the 10 mark to the top of the column of red cells (disregarding the greyish layer of leucocytes) The tube should then be put in the centrifuge at 3 000 revolutions per minute for half an hour and the height of the red cells read (Packed Cell Volume) The observed E S R is then corrected for the observed P C V Since the difference between the normal E S R in men and women depends on the difference in P C V all rates can be corrected to a P C V of 47 per cent A chart is provided which plots E S R horizontally against P C V vertically The intersection of the observed E S R and P C V lines is found The nearest curved line

is then followed down until it intersects the P C V 47 vertical line and the E S R corresponding to this inter section is *the corrected E S R*

Normal reading for men 0 to 9 for women 0 to 20

**Westergren's method.**—It is more convenient to pre pare a slight excess (2 5 ml ) of the citrate blood mixture than the exact amount needed (2 ml ) Take blood into a heparin bottle as in the Wintrobe method The Westergren tube is graduated in 200 divisions begin ning from the top Draw up 3 8 per cent sodium citrate solution to the 150 mark and blow it out into a bottle Then draw up heparinised blood to the zero mark at the top of the tube and eject it into the citrate Mix thoroughly Draw up some of the mixture (of which one fifth is citrate) to the zero mark Set up the tube vertically in the stand with its lower end on a rubber bung After one hour measure the distance from the lower end of the meniscus to the upper surface of the column of red cells This is the E S R As the P C V cannot be measured on the citrated specimen no correction can be applied in this method Normal reading for men 3 to 5 mm for women 4 to 7 mm

**Bodian's method**—This is a micro method using only 0 3 ml of blood The blood is citrated and so no correc tion can be applied Normal reading 3 to 10 graduations in one hour

## Laboratory Aid in Carbon Monoxide Poisoning

With normal haemoglobin levels unconsciousness does not result until 60 per cent of the total Hb is combined with CO but it will do so at lower levels in anaemic patients Gross poisoning with CO can be confirmed by

diluting blood 1 in 300 with dilute ammonia (0 4 ml of Ammonia S G 0 88 in 100 ml of water) and noting its pink colour compared with normal blood similarly diluted *The reversion spectroscope is necessary to detect* small amounts of HbCO in the presence of oxyhaemoglobin The bands of the two spectra of oxyhaemoglobin are adjusted to overlap exactly Then the patient s diluted blood is substituted If HbCO is present the alpha bands move slightly to the violet end of the spectrum—complete saturation with CO causing a shift of 60 Angstrom units This method will detect 50 per cent or more of CO in the blood Percentages as low as 20 per cent can be found by refinements in the method Send heparinised blood covered with liquid paraffin but don t take it too long after admission as breathing fresh air soon gets rid of CO

## SUSPECTED LEAD POISONING

1 Ask *for an examination of a blood film for punctate* basophilia 8 punctate red cells per 1 000 indicates lead toxaemia (though not necessarily clinical poisoning)

2 Estimation of lead in blood may be made in doubtful cases Blood must be taken with a special Pyrex syringe and either put into a Pyrex tube containing oxalate for transference to the laboratory or direct into the laboratory crucible 0 05 mg of lead or more per 100 ml of blood indicates lead poisoning

3 If urine is sent it should be a 24 hour specimen passed directly into a chemically clean bottle prepared by the laboratory Up to 0 08 mg per litre is normally found in healthy people

### THICK FILMS FOR MALARIA

If malaria is suspected thick as well as ordinary films should be made during a rise of temperature and also at its peak. Using a match stick or needle spread out a drop of blood to cover an area of a shilling. Keep the slide horizontal and allow the blood to dry thoroughly. *Protect it from dust* and do not blot it. The slide should be sent to the laboratory for staining. It is put face downwards in running tap water until completely dehaemoglobinised. It is then fixed for fifteen minutes in absolute alcohol and stained with Leishman's stain. This method enables us to find parasites when few are present.

### GLUCOSE TOLERANCE TEST

Special techniques using capillary blood may be used if the test is done by the laboratory worker. If the house physician obtains the specimen himself the following technique is suitable.

The patient should preferably be in bed and should have had a normal diet for the previous few days. No food at all should be eaten for twelve hours before the test but the patient may take a cup of tea without sugar or milk four hours before the test.

Ask the patient to empty his bladder and straight away take 5 ml. of venous blood into a fluoride bottle. The patient then drinks 50 G. glucose in 250 ml. of water flavoured with lemon juice. (For children give 1 G. glucose per 3 lb. body weight.) Take specimens of blood half, one, one and a half and two hours afterwards. Urine should be collected at one and two hours. Label all specimens correctly.

A normal patient shows a fasting blood sugar of 80 to 100 mg. per 100 ml. and a maximum rise within an hour

to 140 to 180 mg per 100 ml The fasting level should be regained in two hours Sugar should be absent from both specimens of urine

### INSULIN SENSITIVITY TEST

A diet containing at least 300 G of carbohydrate should be taken on three days prior to the test Only a little water to drink but no food is taken after the evening before the test On the morning of the test blood is taken for fasting blood sugar determination and then 0 1 units of soluble insulin per Kg body weight is injected intravenously In Addison s disease and panhypopituitarism it is wise not to give more than 2 5 units Blood is taken at half hourly intervals for two hours The drop in blood sugar level is generally expressed as a percentage of the fasting level It usually falls to 50 per cent of the fasting level and returns to its previous level in one and a half to two hours In pituitary adrenal and thyroid disease in which the natural antagonism to insulin is deficient the sensitivity to insulin is increased and the fall of blood sugar is greater than normal and lasts longer The duration of hypoglycaemia is more significant than its degree Some sterile 25 per cent dextrose solution should be ready for prompt intravenous injection in case excessive sensitivity to insulin causes alarming hypoglycaemic symptoms In cases of Addison s disease 20 ml of Injection of Suprarenal Cortex B P C should be given intravenously with the dextrose

### URINE CONCENTRATION—DILUTION TESTS

These tests should be avoided in oedematous patients

**Concentration test** (This test is unnecessary if the specific gravity of the urine is over 1025 and it is free

### Thick Films for Malaria

If malaria is suspected thick as well as ordinary films should be made during a rise of temperature and also at its peak Using a match stick or needle spread out a drop of blood to cover an area of a shilling Keep the slide horizontal and allow the blood to dry thoroughly Protect it from dust and do not blot it The slide should be sent to the laboratory for staining It is put face downwards in running tap water until completely dehaemoglobinised It is then fixed for fifteen minutes in absolute alcohol and stained with Leishman s stain This method enables us to find parasites when few are present

### Glucose Tolerance Test

Special techniques using capillary blood may be used if the test is done by the laboratory worker If the house physician obtains the specimen himself the following technique is suitable

The patient should preferably be in bed and should have had a normal diet for the previous few days No food at all should be eaten for twelve hours before the test but the patient may take a cup of tea without sugar or milk four hours before the test

Ask the patient to empty his bladder and straight away take 5 ml of venous blood into a fluoride bottle The patient then drinks 50 G glucose in 250 ml of water flavoured with lemon juice (For children give 1 G glucose per 3 lb body weight) Take specimens of blood half one one and a half and two hours afterwards Urine should be collected at one and two hours Label all specimens correctly

A normal patient shows a fasting blood sugar of 80 to 100 mg per 100 ml and a maximum rise within an hour

first hour or 100 ml in subsequent hours then a urea concentration below 2 5 per cent may not mean renal damage and the test should be repeated

### UREA CLEARANCE TEST

The data required for this test are the volume and urea content of the urine excreted in a given time and the urea content of blood taken during this time As the secretion time is an essential part of the test a stop watch should be used

7 a m Light breakfast Weak tea but no coffee

9 a m Empty bladder (discard)
Set the stop watch at 9 a m and start it as soon as the bladder is empty (As the bladder must be emptied completely the test is valueless in cases of urinary obstruction)

9 45 a m Take blood for blood urea

10 a m Empty bladder Stop the watch as soon as bladder is empty Send *all* of this specimen to the laboratory and put on the label the number of minutes during which it was secreted as shown by the stop watch It may not be exactly 60 minutes
Some pathologists like to have a further timed specimen at 11 a m for a duplicate test

*Interpretation* —The urea clearance is a theoretical expression of the volume of blood which must lose the whole of the urea in it in order to yield the amount of urea excreted in one minute Suppose the secretion rate is 120 ml per hour (2 ml per minute) and the urea content of the urine 1 5 G per 100 ml (1 500 mg per 100 ml ) Then 2 ml of urine contain 30 mg of urea If the blood urea is 40 mg per 100 ml then 30 mg urea will be contained in 75 ml of blood This figure 75 is

from sugar and albumin) Nothing to drink after mid-day on the day before test Dry tea supper and breakfast—preferably containing protein Empty bladder before retiring on night before test and discard this specimen Empty bladder on waking and one and two hours later Save these three specimens Measure the volume of each in a glass cylinder and take the specific gravity of each Use a special hydrometer which reads only between 1010 and 1030 One or more specimens should show a specific gravity over 1020

**Dilution test**—The patient empties his bladder and discards the specimen He empties his bladder again one hour later This specimen is kept He then drinks 600 ml of water and the urine is collected each hour afterwards for four hours The volume and specific gravity of each of the five specimens is measured The total water excreted less the amount which on the basis of the first hour would have been secreted if the 600 ml of water had not been drunk is the extra water excreted This should be at least 450 ml The specific gravity of at least one of the hourly specimens should be as low as 1006

### Urea Concentration Test

Nothing to drink after 10 p m 8 a m empty the bladder and drink urea (15 G dissolved in 100 ml of water and flavoured with tincture of orange) (Don't mention the word urea to the patient lest he thinks he is drinking urine and vomits) The patient may then have a dry breakfast if he wishes Specimens of urine are collected at 9 10 and 11 a m and their urea content determined This should reach 2 5 per cent It may be lower in the first specimen because of the diuretic effect of urea If the volume of urine exceeds 120 ml in the

N B—It is well to do a preliminary test with distilled water to make sure there is no contamination of the chromate solution with chloride

Chlorides should be regarded as absent if the end point is reached with the first drop This may occur in normal persons if urine is very dilute If it occurs in concentrated urine (specific gravity 1020 or more) less than 3 G per litre suggests salt depletion

A patient is not suffering from salt depletion if the urine contains 5 G or more of salt per litre (except in Addison s disease and during the administration of intravenous saline)

## Occult Blood in Faeces

This is most suitably tested for on the ward by the house physician or nurse using a modified Gregersen s test As this is not extremely sensitive a restricted diet is unnecessary though liver and black pudding should be avoided At least 3 ml of blood must have been ingested to give a positive result The test depends on the con version of benzidine to a blue-coloured product by peroxide in the presence of a catalyst such as iron

A waxed paper packet contains a powder consisting of 25 mg of benzidine hydrochloride and 200 mg of barium peroxide This is shaken up with 5 ml of glacial acetic acid and makes a 0 5 per cent solution of benzi dine A smear of faeces on a white filter paper is made from the gloved finger or a swab stick from the rectum or bed pan A little of the solution is poured over it A deep blue colour within 15 seconds indicates the presence of occult blood If no colour change occurs in 30 seconds the test is negative A weakly positive result is one showing a greenish colour within 30 seconds

When sending faeces to the laboratory for a more delicate test the patient should have avoided meat herrings green vegetables purgatives of the senna type and iron medicines for three or four days

These tests are of little value in telling us the site of the haemorrhage When this is high enough to allow

the normal clearance and is obtained from the formula

$$\text{Clearance} = \frac{\text{Urine Urea}}{\text{Blood Urea}} \times \text{Secretion Rate}$$

As the kidneys do not clear the blood completely of urea *during one passage the figure is a theoretical one*

When the secretion rate is less than 2 ml per minute the clearance is proportional to the square root of the secretion rate It is convenient in practice to express clearance as a percentage of normal function over 70 per cent of normal function is within the normal range between 40 and 20 per cent of function indicates moderate renal impairment and under 10 per cent serious impairment

In the case of children and very tall or short adults the height and weight should be given so that the labora tory can apply corrections for body size

## FANTUS TEST FOR CHLORIDES IN URINE

**Reagents and apparatus—**

20 per cent potassium chromate solution
2 9 per cent silver nitrate solution
Distilled water
Test tube
Small pipette ( fountain pen filler ")
N B —The same pipette must be used throughout the tests so that the drops shall be of the same size

**Technique—**

Filter the urine if not already clear and if albumin is present remove by boiling and filtering
Take 10 drops of urine in the test tube
Rinse pipette
Add 1 drop of potassium chromate solution (the indicator)
Rinse pipette
Add silver nitrate solution drop by drop and shake the test tube after each drop
End point is a sharp change of colour from yellow to brown
The number of drops needed to produce the colour change indicates the number of grammes of sodium chloride per litre

is empty by aspirating when sitting up lying on the back face and right and left side The patient should spit out rather than swallow his saliva or sputum Inject subcutaneously 0 5 mg of histamine and withdraw the stomach contents half one and one and a half hours later The specimens are then put in labelled tubes and sent to the laboratory If no free acid is present in the first specimen (as shown by a red colour when a little juice is mixed with Topfer s reagent on a white tile) a further 0 5 mg of histamine may be given but this should be avoided in patients whose blood pressure is grossly abnormal

If we only want to know about the presence or absence of hydrochloric acid (as in ? pernicious anaemia) the simplified meal is sufficient Obtain fasting juice and examine it for free HCl by Topfer s reagent If negative give a cup of water to drink and inject 0 5 mg histamine subcutaneously Take a further sample half an hour later and if there is still no HCl then a diagnosis of achlorhydria can be made

### FAT BALANCE TEST

Don t ask for this test unless you are sure that the nursing and laboratory staff can cope with it Unless carefully performed it is useless The patient eats a diet provided by the dietitian containing a fixed amount (50 G or 75 G ) of fat Any uneaten food must be returned to the dietitian so that the figure for the amount of fat eaten can be adjusted The stools for the first three days are discarded and on the morning of the third day the patient has a simple tap-water enema (no soap) The result is discarded Then for a period of at least seven days all stools (and toilet paper) are collected into a previously weighed and labelled jar On the morning of the last

time for bacterial action to split off the iron fraction porphyrin is formed and can be detected spectroscopically The presence of red cells indicates bleeding low down The degree of bleeding and rate of passage must be taken into consideration

### Ascorbic Acid Saturation Test

8 a m Empty bladder and take 700 mg ascorbic acid
12 noon Empty bladder and discard specimen
2 p m Empty the bladder and keep the specimen Within an hour estimate the ascorbic acid content of the whole of it

Repeat the test daily until the patient excretes more than 30 mg ascorbic acid in the two hour specimen Patients with ascorbic acid deficiency may take more than seven days to reach saturation while normally saturation is reached in three days

### Fractional Test Meal

The main information nowadays desired from a test meal is about the nature of the resting juice and whether *acid is present or not* A *charcoal biscuit may be eaten* at supper time since charcoal particles in the resting juice next morning are good evidence of stasis Antacids and routine medicines should be stopped from the evening before a test meal The teeth should not be brushed before the test lest the gums bleed A Ryle s tube is lubricated with liquid paraffin and then passed by *the nose or mouth and swallowed down into the stomach* Occasionally spraying the throat with 2 per cent Butacaine Sulphate (Butyn Abbott) is necessary The tube is marked at 40 cm (= the cardia) and 57 cm (= the pylorus) By suction with a syringe the resting juice is obtained and put in a bottle Make sure that the stomach

**Jaundice**—A strongly positive flocculation reaction and an alkaline phosphatase level under 15 units suggests that jaundice is non obstructive A negative flocculation reaction and an alkaline phosphatase level over 35 units suggests that jaundice is obstructive

## THE KEPLER TESTS FOR ADRENAL CORTICAL INSUFFICIENCY (ADDISON S DISEASE)

These tests must not be used in patients who have renal disease or oedema of any kind

**Procedure 1 A test of the ability to have diuresis**— This test is based on the fact that patients with adrenal cortical insufficiency fail to show the normal degree of diuresis following a rapid intake of water

*The volume of night urine is measured then water is* drunk (9 ml per pound body weight) and hourly urine volume measured If the volume of the largest hourly specimen is less than the volume of night urine the test is positive and Addison s disease is not excluded

On the day before the test the patient eats three ordinary meals but omits extra salt He must not eat or drink anything after 6 o clock in the evening Until this time he may drink water as desired At 10 30 p m he empties his bladder and discards the urine All urine which is voided from then on until and including that passed at 7 30 a m is collected The volume of this urine is measured and saved for chemical analysis if this should be necessary later Breakfast is omitted The patient empties his bladder again at 8 30 a m and immediately thereafter he is given 20 ml of water per Kg of body weight (9 ml per pound) He is asked to drink this within the next forty five minutes At 9 30 10 30 11 30

day a tap water enema is given and the result added to the stools already collected The whole specimen is sent to the laboratory for fat estimation No laxatives must be given during the test Absorption of less than 90 per cent of the fat intake indicates deficient absorption

If it is wished to avoid enemas as in children an alternative technique is to give two capsules of carmine (about 200 mg in each) with breakfast and save the stool in which it first appears and subsequent ones On the day before the test is to end give two or three charcoal biscuits with breakfast Save all stools until the one in which charcoal appears and discard this one Send the collected specimens to the laboratory

The following simplified method involves less work for nurses and technicians Ask the pathologist for details Briefly the procedure is to collect the faeces for three or four twenty four hour periods separately These are homogenised and their fat contents estimated On the usual daily intake of up to 100 G of fat normal people excrete not more than 5 G of fat per day

### Liver Function Tests Normal Values

| | |
|---|---|
| Bromsulphalein test | Blood is taken five and forty five minutes after injecting 5 mg of dye per Kg body weight intravenously A normal liver clears the blood of dye in forty five minutes |
| Serum bilirubin | Less than 1 mg per 100 ml |
| Icteric index | 3 to 8 units |
| Urobilinogen in urine | Normally absent |
| Serum alkaline phosphatase | 3 to 13 King Armstrong units per 100 ml |
| Thymol turbidity reaction | 0 to 4 units |
| Thymol flocculation reaction | Negative in absence of parenchymatous liver disease |
| Plasma proteins (diet must be adequate and albuminuria absent) | |
| | Total 6 3 to 8 29 G per 100 ml |
| | Albumin 3 5 to 5 7 G per 100 ml |
| | Globulin 1 5 to 3 0 G per 100 ml |

From these four determinations and from the results obtained from Procedure 1 the following factor is cal culated

$$\frac{\text{Urea in urine (mg per cent)}}{\text{Urea in plasma (mg per cent)}} \times \frac{\text{Chloride in plasma (mg per cent)}}{\text{Chloride in urine (mg per cent)}} \times \frac{\text{Volume of day urine (ml)}}{\text{Volume of night urine (ml)}}$$

The term day urine ' applies to the largest of the hourly specimens voided during the day night urine ' to the entire amount which was voided from 10 30 p m to 7 30 a m If the value of the factor is greater than 30 the patient probably does not have Addison s disease If the factor is less than 25 the patient probably has Addison s disease provided that nephritis has been excluded The result is an all or nothing one and does not indicate degrees of adrenal cortical insufficiency

## Specific Gravity of Plasma

This may be quickly and easily measured by the falling drop method It is useful in deciding how much fluid (but not salt) is needed to correct severe dehydration The laboratory has a row of bottles of copper sulphate solution of different specific gravities The patient s plasma is obtained by centrifuging heparinised blood and a drop of it is released into the bottle from a pipette whose point is 1 cm above the surface of the solution The rise or fall of the drop during the ten seconds after it has lost its initial momentum indicates whether it is lighter or heavier than the test solution It is well to do a control test on normal plasma at the same time A bottle of 100 ml of the solution may be used 100 times before its specific gravity is affected The normal specific gravity is 1027 and for every 0 001 rise above this 200 ml of

*a m and 12 30 p m he is requested to empty his bladder* In order to eliminate the effects of exercise and posture on urinary excretion he is kept at rest in bed except when up to void Each specimen is kept in a separate container The volume of the largest one of these four specimens is measured ( day urine )

*Under these conditions some patients having Addison s* disease will excrete so little urine that they are unable to void more than once or twice during the entire morning In such instances the amount of urine excreted per hour may be calculated frequently however such calculations are unnecessary because of the very low urinary output throughout the entire morning

*Inferences that may be drawn from Procedure 1*— (1) If the volume of any single hourly specimen voided during the morning is greater than the volume of urine during the night the response to the test is negative that is such a response indicates the absence of Addison s disease (2) If the volume of the largest hourly specimen voided during the morning is less than the volume of urine voided during the night the response to the test is positive that is Addison s disease may or may not be present To establish the diagnosis Procedure 2 should be instituted

***Procedure 2 A test of the ability to eliminate urea and conserve chloride***—This test depends on the fact that in Addison s disease the kidneys retain urea but excrete an excessive amount of salt

*Details*—Take blood before giving the water in Procedure 1 and estimate the chloride and urea in its plasma Also measure the volume of the mixed night urine and estimate its chloride and urea content

From these four determinations and from the results obtained from Procedure 1 the following factor is calculated

$$\frac{\text{Urea in urine (mg per cent)}}{\text{Urea in plasma (mg per cent)}} \times \frac{\text{Chloride in plasma (mg per cent)}}{\text{Chloride in urine (mg per cent)}} \times \frac{\text{Volume of day urine (ml)}}{\text{Volume of night urine (ml)}}$$

The term day urine applies to the largest of the hourly specimens voided during the day ' night urine to the entire amount which was voided from 10 30 p m to 7 30 a m If the value of the factor is greater than 30 the patient probably does not have Addison s disease If the factor is less than 25 the patient probably has Addison s disease provided that nephritis has been excluded The result is an all or nothing one and does not indicate degrees of adrenal cortical insufficiency

### SPECIFIC GRAVITY OF PLASMA

This may be quickly and easily measured by the falling drop method It is useful in deciding how much fluid (but not salt) is needed to correct severe dehydration The laboratory has a row of bottles of copper sulphate solution of different specific gravities The patient s plasma is obtained by centrifuging heparinised blood and a drop of it is released into the bottle from a pipette whose point is 1 cm above the surface of the solution The rise or fall of the drop during the ten seconds after it has lost its initial momentum indicates whether it is lighter or heavier than the test solution It is well to do a control test on normal plasma at the same time A bottle of 100 ml of the solution may be used 100 times before its specific gravity is affected The normal specific gravity is 1027 and for every 0 001 rise above this 200 ml of

water is lacking in the vascular compartment of body fluid (providing the plasma proteins were originally normal)

## Blood Counts

**Red cells**—First get a tube with ground glass stopper containing 4 ml of red cell fluid (1 per cent formalin in 3 per cent sodium citrate) Prick the lobe of the ear or the finger (don t squeeze) and draw up blood to the 0 02 ml mark in a ' haemoglobin pipette and add this amount to the tube This gives a dilution of 1 in 200 (strictly 1 in 201) Shake for about a minute

Using a needle lower the special cover glass on to the counting slide The centre of the glass should overlie the ruled area It is correctly flat when Newton s concentric refraction rings appear

Take up some fluid from the tube with a Pasteur pipette and allow a drop to run under the cover glass by capillary action If fluid enters the moat' begin again After allowing to settle for a minute or two count the red cells in eighty small squares (five sets of sixteen large squares)

When cells lie on lines only count those on the upper and left hand lines so that no cell is counted twice The area counted is 5 × 16 × 1/400 square millimetre The chamber depth is 0 1 mm Hence at dilution 1 in 200 the volume of fluid counted is

$$\frac{5 \times 16}{10 \times 400 \times 200} = \frac{1}{10\,000} \text{ cu mm *}$$

Although the thousandth part of a litre is now called a millilitre it is nevertheless correct to speak of the volume used in blood counting as a cubic millimetre rather than a millimil This is because a *cubic millimetre is a volume based strictly on a linear* measurement—the millimetre—whereas the ml or thousandth part of a litre is a measure of volume not so based.

The red cell count is therefore the number of cells in five sets of sixteen squares multiplied by 10 000

**White cells** —Proceed as in the red cell count but put the 0 02 ml of blood into a stoppered bottle containing 0 380 ml of white cell fluid (2 per cent acetic acid coloured with gentian violet) This gives a dilution of 1 in 20 Count four sets of sixteen large squares *i e* a total area of 4 sq mm At dilution 1 in 20 and chamber depth 0 1 mm the volume of blood counted is

$$\frac{4}{10 \times 20} = \frac{1}{50} \text{ cu mm}$$

Hence the number of cells in sixteen large squares multiplied by fifty equals white cell count in cells per cu mm

Leave the pipettes clean Draw water alcohol and ether through them in this order and then dry in air

If absolute values are wanted blood should be taken into a heparin bottle so that it can be used for the haematocrit reading This blood can be used for the blood count by the usual technique but it is not quite so satisfactory for the white count as the cells tend to stick together

**Haemoglobin estimation** —The house physician should make himself familiar with the particular form of haemoglobinometer in the laboratory whether it be a photo electric colorimeter using alkaline haematin and an artificial standard or the Medical Research Council circular grey wedge photometer For the M R C photo

*Note* —If the house physician does not do the red cell count himself he should not ask the laboratory to do it without due consideration It is at best very inaccurate and in most cases the clinician can get all the information he needs from estimation of Hb P C V (to give the M C H C) and a blood film

meter 0 02 ml of blood in the pipette is placed in a tube containing 0 04 per cent solution of ammonia The volume is made up to 4 ml (= 1 in 200) and the fluid is put in the photometer Haemoglobin is estimated as oxyhaemoglobin by its power of absorbing green light compared with that of the calibrated grey wedge

For rapid bedside examination the Tallqvist method using blotting paper and a scale of red colours is more accurate than is generally supposed

**Blood films** —Use a new slide cleaned with a handkerchief and one with its corner broken off as a spreader Excessive cleaning prevents the formation of a smooth film Touch the pricked ear with the slide so that a drop of blood is left near one end Hold the spreader at an angle of 40 degrees to the slide and move it back to touch the drop Then move the spreader quickly forwards to make a film 3 cm long Let the film dry in the air Write the patient's name on it in pencil Flood the slide with Leishman's stain for half a minute or so Then add twice the amount of distilled water whose pH has been adjusted to 6 8 and leave for ten minutes before washing and drying Lymphocytes tend to stay in the middle of the film and polymorphs to move to the tail especially in slowly spread films If a film is satisfactory polymorphs should be present in the centre Cells in longitudinal strips of the film should be counted

## NORMAL VALUES IN HAEMATOLOGY

**Total blood volume** —This is 75 ml per Kg in a man 65 ml per Kg in a woman and 100 ml per Kg (or 40 ml per lb) in an infant A man weighing 11 stone (154 lb or 70 Kg) therefore has 5 200 ml of blood or roughly 8¾ pints

**Red Cells**—The average mean normal for an adult is 5 million per cu mm In more detail

| | |
|---|---|
| Men | 4 5 to 6 8 millions per cu mm |
| Women | 3 9 to 5 6 |
| Children at one year | 4 5 |
| Children at ten years | 4 7 |

**Packed cell volume** (P C V or haematocrit reading)—This is the volume of packed cells per 100 ml of blood It is 47 per cent in men and 42 per cent in women Low readings are found when the number or size of red cells is diminished and indicate anaemia High readings are found when there is haemoconcentration

**White count**—Total 4 000 to 10 000 per cu mm

| | Percentage | Total per cu mm of blood |
|---|---|---|
| Granulocytes | | |
| Neutrophil | 40 75 | [illegible]500 7 500 |
| Eosinophil | 1 6 | [illegible]00 400 |
| Basophil | 0 1 | 15 100 |
| Lymphocytes | 20 45 | 1 500 3,500 |
| Monocytes | 2 10 | 200 800 |

For each type of cell the absolute count is of much more value than its percentage of the total which can be misleading in counts outside the normal range

**Mean haemoglobin content**—14 8 G per 100 ml of blood This represents 100 per cent in the Haldane scale

**Reticulocytes** —0 1 to 1 5 per cent

**Platelets** —250 000 to 400 000 per cu mm

**Red cell fragility** —Normally haemolysis begins in saline of strength 0 45 G per 100 ml and is completed in saline of strength 0 35 G per 100 ml

**Bleeding time** (Ivy) —1 to 4 minutes
(Duke) —2 to 5 minutes

**Coagulation time** (Lee and White using venous blood at 37 C) —4 to 10 minutes

ABSOLUTE VALUES '

The old index system *e g* colour index was based on fixed arbitrary figures taken as normal Absolute Values are calculated from observed figures and so the *range* of normality is taken into account

**Mean corpuscular volume (M C V)**—This is the average volume in cubic microns (cμ) of a single red cell and is calculated from

$$\frac{\text{Volume of packed cells expressed as a percentage} \times 10}{\text{Red cells in millions per cu mm}}$$

For example if the P C V is 45 per cent then 1 cu mm of blood (= 5 000 000 cells) contains 0 45 cu mm of cells and the volume of one cell (M C V) is

$$\frac{0\ 45 \text{ cu mm}}{5\ 000\ 000} = 90 \text{ c}\mu$$

The normal reading is 86 cμ Increase means macro cytosis (or spherocytosis) and decrease means microcytosis

**Mean corpuscular haemoglobin (M C H)**—This is the average amount of Hb in micro microgrammes per red

cell For example if 100 ml of blood contains 15 G Hb then 1 cu mm of blood contains

$$\frac{15}{100 \times 1\,000}$$

As 1 cu mm of blood contains 5 000 000 red cells each cell contains

$$\frac{15}{100 \times 1\,000 \times 5 \times 10^6} \text{ G Hb}$$

or 30 micro microgrammes The normal range is 27 to 30 micro microgrammes

**Mean corpuscular haemoglobin concentration (M C H C)**—While the colour index or

$$\frac{\text{percentage of haemoglobin}}{\text{number of red cells expressed as a percentage of } 5 \times 10^6}$$

(normally 1) expresses the saturation of red cells with haemoglobin the M C H C does this more accurately without reference to an arbitrary figure for normal It is really the amount of Hb in 100 ml of red cells (not whole blood) The red cells in 100 ml of whole blood occupy 45 ml (packed cell volume or P C V or haema tocrit reading) and the amount of Hb in 100 ml of blood is 15 G Then 100 ml of *red cells* contain

$$\frac{15}{45} \times 100 = 33\ 3 \text{ G of Hb}$$

The M C H C is calculated from

$$\frac{\text{Hb in G per 100 ml of blood}}{\text{P C V in ml per 100 ml of blood}} \times 100$$

The normal range is 32 to 38 Low values mean that red cells are not fully saturated with Hb Should the anaemia be macrocytic (M C V over 86cμ) and the M C H C low (less than 32) it means that iron as well as liver is indicated

**Packed cell volume (P C V )**—This is the percentage of the volume of blood occupied by red cells A Wintrobe tube is filled to mark 10 as for the Erythrocyte Sedimentation Rate and put in the centrifuge at 3 000 revolutions per minute for half an hour The height of the packed red cell column is then read

### THE ACCURACY OF SOME HAEMATOLOGICAL ESTIMATIONS

It is important for the clinician to know whether a numerical difference in two reported readings represents a real change or an inaccuracy in the method The degree of error is computed mathematically and it is sufficient here merely to give a table showing the significant differences expressed as a percentage of the normal readings The significant differences for readings above and below normal levels approximate to these figures It should be remembered that red cell counts are always very inaccurate and especially so when only 500 cells are counted whereas the Hb estimation and the P C V have only a small error On the other hand errors in the white cell count are not so important A 20 per cent error for example would only raise or lower a 5 000 cell count by 1 000 which would be within the limits of physiological variation

## Accuracy of Haematological Investigations

| Investigation | Normal reading in round figures | Significant difference expressed as a percentage of the normal reading |
|---|---|---|
| Haemoglobin (Haldane) | 100 | 14 8 |
| Haemoglobin (M R C photometer) | 14 8 G per 100 ml | 8 4 |
| Red cell count | 5 million per cu mm | 26 6 *i e* 1 3 millions |
| Reticulocytes | 0 1 to 1 5 per cent | 113 3 |
| Platelets | 250 000 per cu mm | 64 2 |
| *Haematocrit* | 45 | 2 4 |
| Coagulation time (Lee & White) | 5 minutes | 13 3 (*i e* 0 66 minute) |

## OTHER NORMAL VALUES FOR BLOOD

(S = Serum)
(P = Plasma)
(B = Whole blood)

Sugar —B —80 to 120 mg per 100 ml (fasting)

Urea —B —20 to 40 mg per 100 ml (15 to 50 in children and old folks 15 to 30 during pregnancy)

Uric acid —S —2 0 to 6 0 mg per 100 ml

Alkali reserve —P —53 to 77 vols of $CO_2$ per 100 ml (23 34 mEq/litre)

Alkaline phosphatase —S or P —3 to 13 King Armstrong units

Acid phosphatase —S or P —0 to 4 King Armstrong units

Cholesterol —S or P —115 to 260 mg per 100 ml

Serum proteins —S —6 to 8 G per 100 ml (Albumin 4 to 5 Globulin 1 2 to 2 9)

Chloride —P —560 to 620 mg per 100 ml (as NaCl) 340 to 380 mg per 100 ml (96 to 108 mEq/litre) (as chloride)

Calcium —S —9 to 11 mg per 100 ml

Phosphorus —S or P —2 to 4 mg per 100 ml

Potassium —S —14 to 21 mg per 100 ml (3 6 to 5 4 mEq/litre)

Sodium —S —300 to 350 mg per 100 ml (130 to 152 mEq/litre)

Bilirubin —S —0 1 to 1 0 mg per 100 ml

Diastase —P or S —Wohlgemuth—less than 10 units per ml
Somogyi—70 to 200 units per 100 ml

**Agglutination tests —**

*Paul Bunnell test for glandular fever* —The minimum diagnostic titre of unabsorbed serum which agglutinates sheep s red cells is 1 in 128 but this test may be confused by the antibody of serum sickness and by the natural antibody It is usual therefore to perform it also (1) on serum treated with a suspension of guinea pig kidney and (2) on serum treated with ox cells Glandular fever can be differentiated because agglutination occurs with (1) but not with (2) For details consult the pathologist

*Cold agglutination salmonella dysentery and brucella organisms* —The pathologist will give an opinion as to the significance of the result The test alone should not be interpreted without the other evidence

| | | |
|---|---|---|
| **Erythrocyte sedimentation rate (E.S R )—** | Wintrobe | Men 0 to 9 |
| | | Women 0 to 20 |
| | Westergren | Men 3 to 5 |
| | | Women 4 to 7 |
| | Bodian | 3 to 10 |

## Normal Cerebro-Spinal Fluid

Clear and colourless

Pressure 125 mm

Cells —Up to 4 lymphocytes

Protein —20 to 40 mg per 100 ml and globulin not in excess (i e trace only)

Chlorides (as NaCl) —Adults 720 to 750 mg per 100 ml children 700 to 760 mg per 100 ml Since Na and Cl ions may vary independently it is better to give the concentration of chloride ions normally 425 to 460 mg per 100 ml or 120 to 130 mEq/litre

Glucose 50 to 70 mg per 100 ml

Urea 15 to 30 mg per 100 ml

Lange's colloidal gold curve—
- normal 0000000000
- meningitic 0000123433
- luetic 0024321000
- paretic 5554433100

## Cerebro-spinal Fluid Cell Count

It is sufficient to add one drop of 0 2 per cent toluidine blue to about 0 5 ml of CSF The fluid should be allowed to stand for not more than ten minutes It is then put in a Fuchs Rosenthal counting chamber and the white cells which are stained blue counted under the $^1/_6$th inch objective The amount of dilution by the stain may be neglected The number of cells in 85 small squares is the cell count in cubic millimetres

## CSF IN POLIOMYELITIS

| | B f paraly | Aft par ly |
|---|---|---|
| Appearance | Clear and colour less | Clear and colour less |
| Cells | Up to 2000 per cu mm 25 per cent polymorphs | 5 to 10 lymphocytes |
| Protein | Normal or slightly raised | About 100 mg per 100 ml |
| Globulin | Negative | + |
| Chlorides and Glu ose | Normal | Normal |
| Lange | No change | 0011210000 |

### *Normal Cerebro-Spinal Fluid*

Clear and colourless

Pressure 125 mm

Cells —Up to 4 lymphocytes

Protein —20 to 40 mg per 100 ml and globulin not in excess (*i e* trace only)

Chlorides (as NaCl) —Adults 720 to 750 mg per 100 ml children 700 to 760 mg per 100 ml Since Na and Cl ions may vary independently it is better to give the concentration of chloride ions normally 425 to 460 mg per 100 ml or 120 to 130 mEq/litre

Glucose 50 to 70 mg per 100 ml

Urea 15 to 30 mg per 100 ml

Lange s colloidal gold curve—
- normal 0000000000
- *meningitic* 0000123433
- luetic 0024321000
- paretic 5554433100

### Cerebro spinal Fluid Cell Count

It is sufficient to add one drop of 0 2 per cent toluidine blue to about 0 5 ml of C S F The fluid should be allowed to stand for not more than ten minutes It is then put in a Fuchs Rosenthal counting chamber and the white cells which are stained blue counted under the $^{1}/_{6}$th inch objective The amount of dilution by the stain may be neglected The number of cells in 85 small squares is the cell count in cubic millimetres

### ARTERIAL BLOOD ANALYSIS

Oxygen saturation (breathing air)

$$i.e. \left(\frac{O_2 \text{ content}}{O_2 \text{ capacity}} \times 100\right) \quad 95 \text{ per cent}$$

$CO_2$ content of arterial blood —45 to 55 volumes per 100 ml

$CO_2$ content of plasma —55 to 65 volumes per 100 ml

CO tension ($pCO_2$)

(calculated from plasma $CO_2$ and pH) —35 to 45 mm of mercury

pH at 38 C —7 38 to 7 41

Alkali reserve ($CO_2$ combining power) of venous blood —53 to 77 volumes per 100 ml (23 to 34 mEq/litre)

### MILLI EQUIVALENTS

Chemical substances in body fluid react together not by their absolute weights but by their equivalent weights (The equivalent weight of an element is that weight which will combine with or take the place of 8 parts by weight of oxygen For univalent elements the equivalent weight is the same as the atomic weight for divalent elements it is half the atomic weight and so on) It is convenient to express in terms of milli equivalents substances such as acids and bases which react together Acid radicles are chloride bicarbonate (expressed in terms of $CO_2$) phosphate sulphate organic acids and proteins Basic radicles are sodium potassium calcium and magnesium A milli-equivalent of any substance is the amount con tained in 1 ml of its normal solution (A normal solution contains the equivalent weight of a substance in grammes per litre The term normal saline however is physio-logical or isotonic saline and is only about one sixth the strength of chemically normal saline) 1 milli-equivalent of sodium is 23 mg and so on

## CSF IN MENINGITIS

| | Pyogen c | T berculous | Virus |
|---|---|---|---|
| Pressure | + + | + + | + |
| Appearance | Turbid | Opalescent | Clear |
| Cells | Hundreds or thousands Polymorphs | Tens or hundreds Mainly lymphocytes | Up to 200 Lymphocytes |
| Protein | Increased 100 mg or more | Increased 100 mg or more | Around 100 mg |
| Globulin | + | + | + |
| Chlorides | Decreased down to 650 mg per 100 ml | 600 to 650 mg per 100 ml Below 550 is practically diagnostic | Only a slight decrease say 680 |
| Glucose | Absent | Decreased 20 to 40 mg per 100 ml Falls earlier than chlorides do | Normal |
| Smear | Organisms visible | Tubercle bacilli may be visible | None |
| Culture | + | + | Steri |

Blood plasma has normally about 7 G protein per 100 ml and thus has the power of binding about 16 mEq/litre of base

Equivalent weights of common substances are —sodium 23 potassium 40 calcium 20 chlorine 35 5 sodium chloride 58 5 bicarbonate 22 4 (The latter is not strictly the equivalent weight but as explained above is used in the same way)

### Normal Values (Blood)

| | mg per 100 ml | mg per litr | Equivalent Weights | mEq/litr |
|---|---|---|---|---|
| Chloride (as chlorine) | 355 | 3 550 | 35 5 | 100 |
| (as sodium chloride) | 585 | 5 850 | 58 5 | 100 |
| Sodium | 330 | 3 300 | 23 | 14– |
| Potassium | 20 | 200 | 40 | 5 |
| Calcium | 10 | 100 | 20 | 5 |
| Bicarbonate | 60 ml | 600 ml | 22 4 | 27 |

### Urine Testing

The house physician should on occasion take pride in performing certain simple urine tests properly and should not expect these always to be performed by the laboratory or nursing staff The urine is best inspected in a conical glass of the old fashioned type Sometimes ingenuity is needed to obtain or test a specimen *e g* wringing out a napkin or performing the nitroprusside test on the bed sheets of an incontinent patient

**Albumin** —Tests for albumin are often carelessly per formed The urine should be filtered if cloudy and the

The term milli-equivalent per litre (mEq/litre) means the thousandth part of the equivalent weight of the substance in grammes per litre The simplest way of converting mg per 100 ml into mEq/litre is to express the substance as mg per litre and divide by its equivalent weight (= atomic weight - valency)

$$i\,e \quad \text{mEq/litre} = \frac{\text{mg per } 100 \text{ ml} \times 10}{\text{equivalent weight}}$$

Conversely mEq/litre can be converted into mg per 100 ml by multiplying mEq/litre by the equivalent weight and dividing by 10

$$i\,e \text{ mg per } 100 \text{ ml} = \frac{\text{mEq/litre} \times \text{equivalent weight}}{10}$$

The cases of bicarbonate and proteins require special explanation

**Bicarbonate** —We measure the plasma bicarbonate by the amount of CO which it will yield—normally about 60 ml per 100 ml of plasma or 600 ml per litre Now the molecular weight in grammes of any gas occupies 22 4 litres at normal temperature and pressure In the case of $CO_2$ the molecular weight is also the equivalent weight If 600 is divided by 22 4 we get 27 which is the figure for the mEq/litre of CO derived from bicarbonate

**Proteins** —Proteins act as weak acids and are expressed in terms of the amount of base they neutralise The average equivalent weight of proteins is that part of their molecular weight which will neutralise 1 equivalent of NaOH When the concentration of protein in mg per litre is divided by this we obtain a figure for the milli equivalents of protein It is more simple to use the formula

Protein in G per 100 ml $\times$ 2 43 = mEq/litre

The results compare as follows —

| G per litre (Esba h) | G per ent per 100 1 | H t test |
|---|---|---|
| 10 | 1 | / volume |
| 5 | 0 5 | / volume |
| 1 to 2 | 0 1 to 0 ~ | Granular deposit |
| 1 | 0 1 | Heavy cloud |
| <1 | <0 1 | Slight cloud or trace |

**Sugar**—Take 2 5 ml (about ½ inch in a test tube) of Benedict s solution add four drops of urine and boil for two minutes A green orange or brick red turbidity indicates sugar A trace of sugar may show only as a yellowish precipitate like grains of sand There are few fallacies If there is doubt ask the pathologist to identify the reducing substance He will use the osazone test or the more reliable method of paper chromatography A translucent green appearance but without a yellowish deposit does not indicate sugar (Patients taking thio uracil may show a black deposit)

CLINITEST METHOD—Place five drops of urine in a short test tube Rinse the dropper and place ten drops of water in the tube Put one clinitest tablet into the tube and wait fifteen seconds before shaking and reading the result A colour change to shades of green brown and orange indicates the presence of sugar

**Ketone bodies**—These are often referred to as acetone but this substance though it may occur in the breath is only present in traces in fresh urine 70 per cent

*test tube nearly filled* Make it faintly acid to *litmus* paper by adding 10 per cent acetic acid drop by drop Boil the upper inch and compare it with the clear urine below Whether cloudy or not add a few drops more of acetic acid If the cloud disappears it was phosphates *only If the urine remains clear albumin is not present* Cloudiness which persists after boiling even if it clears a bit after adding acid indicates albumin If cloudiness appears after adding acid to a urine which was clear on boiling it also indicates albumin

SALICYL SULPHONIC ACID TEST —Add drop by drop a 20 per cent aqueous solution of salicyl sulphonic acid Albumin and globulin give a precipitate (and also Bence Jones protein but this clears on heating) Patients who have taken phenıodol (but not Telepaque) the previous *day for cholecystography may give a false positive test* High concentrations of penicillin may give similar false positive tests

THE AMOUNT OF ALBUMIN —This can be expressed in several ways

*Heat coagulation* —The acidified urine should be boiled and the result described as slight cloud heavy cloud etc or if there is much albumin it should be allowed to settle for twenty four hours and the volume it occupies expressed as a proportion of the total fluid in the tube

*Esbach s method* —Pour the acidified urine into an Esbach tube up to the mark U Add Esbach s reagent up to the mark R Close the tube with a cork and mix its contents Allow to stand twenty four hours and then read the height of the protein precipitate from the bottom in grams per litre

**Blood** —Red blood cells and haemoglobin can be detected by the guaiacum test Put one inch of urine in a test tube and add two or three drops of fresh tincture of guaiacum A white precipitate forms Holding the tube at an angle pour on one inch of ozonic ether Do not shake but allow a separate layer to form A blue ring indicates blood (Iodides and pus give false positive results) To differentiate between blood and haemoglobin microscopy is necessary

**Bile pigments** —Bile stained urine shows a yellow froth on shaking

FOUCHET S TEST —Make the urine acid with acetic acid To a test tube half full of urine add half its volume of 10 per cent barium chloride Shake and filter Re move the filter paper and allow it to dry Put one drop of Fouchet s reagent on its edge A green colour indicates the presence of bile pigment

TABLET TEST —Moisten the special asbestos test mat with five drops of urine and put the tablet of dye on it Place one drop of water on the tablet and a few seconds later another drop which washes fluid on to the mat If bilirubin is present the mat around the tablet turns purple Any colour developing after thirty seconds is ignored Urobilin does not give a false positive test

**Microscopic examination of urine** —The urine should be centrifuged and the deposit examined for blood cells pus casts crystals and organisms In some laboratories it is the practice to do the cell count on undiluted urine using a C S F counting chamber The normal cell count is very similar to that of C S F —up to 10 cells per cu mm being regarded as normal

of the ketone bodies in the urine consists of β hydroxy butyric acid for which we cannot test The remaining 30 per cent is nearly all diacetic acid This is detected by the nitroprusside test in dilutions of 1 in 400 000 Acetone (which is formed when diacetic acid decomposes) gives a positive nitroprusside reaction in dilutions of only 1 in 20 000 The ferric chloride test is positive for diacetic acid in dilutions of 1 in 2 000 and is negative for acetone

NITROPRUSSIDE TEST —Put about half an inch of the mixture of ammonium sulphate and nitroprusside crystals in the test tube and add one inch of urine Shake and add more crystals if necessary so that some remain un dissolved Add $^1/_4$ inch of strong ammonia and shake If positive a purple colour develops

FERRIC CHLORIDE TEST —Add 10 per cent ferric chloride solution drop by drop to some urine Diacetic acid is shown by a reddish brown colour Phosphates give a precipitate but this dissolves when excess of ferric chloride is added Do a control on normal urine if the result is doubtful

Aspirin and similar substances give a purple colour Prior boiling does not abolish the reaction if due to aspirin but it will drive off the volatile diacetic acid and render subsequent tests negative

ACETEST TABLETS —Place a tablet on a clean surface Put one drop of urine on it Take a reading in thirty seconds When the test is positive the colour varies from lavender to deep purple When negative the tablet simply becomes creamy from wetting This test is inter mediate in sensitivity between the nitroprusside and ferric chloride tests

an orange colour and the froth is yellow Large amounts make the urine reddish brown and in long standing jaundice when the pigment is mainly biliverdin the urine is dark green

Riboflavin (vitamin B ) is commonly given in multi vitamin pills and makes the urine very yellow Santonin and chrysophanic acid (from rhubarb and senna) make an acid urine yellow When flavine and picric acid are applied to raw surfaces sufficient may be absorbed to colour the urine more yellow than normal The new anti coagulant phenindione is said to turn the urine a pinkish orange colour

**Red and pink urines**—Uroerythrin usually shows as a pink or brick dust rather than red deposit of urates in cases of congestive cardiac failure Its only importance is that patients may think it is blood Really red urine is generally caused by blood or haemoglobin Both give the chemical and spectroscopic tests for blood but haema turia is distinguished from haemoglobinuria by the presence of red cells and by the fact that filtration largely clears it The experienced eye can detect small quantities of blood in the urine because in addition to the character istic smokiness the meniscus is dark and the urine in the upper part of the vessel is rather pink compared with the rest After standing for some time blood in the urine becomes brownish from the formation of methaemo-globin

Numerous extraneous pigments will colour the urine red A meal of beetroot will do it Eosin in sweets causes the urine to be very pink with a greenish fluorescence Mercurochrome if injected causes red urine Santonin and chrysophanic acid already mentioned will make the urine pink if it is alkaline

### Sending Urine to the Laboratory

For laboratory investigations a generous specimen say 200 ml should always be sent For urea clearance tests and estimations of total output of various constituents the quantity of urine passed must be accurately measured So ask the nurse to send the whole specimen to the laboratory and not just enough to fill the bottle No preservative is needed as a rule but if urine has to be kept add 5 ml of chloroform to 100 ml of urine As it reduces copper solution boil it off before testing for sugar

### Abnormal Colour of the Urine

Normal urine is coloured by urochrome and varies from pale straw to deep amber The depth of colour depends on the concentration and so the urine is always pale in polyuria Quite colourless urine suggests diabetes insipidus Broadly speaking urines from the point of view of colour fall into four groups

1 Yellow
2 Red
3 Brownish black
4 Greenish blue

In considering the unusual colour of any specimen we should ask ourselves the questions —

1 Is there an excess of normal pigment?
2 Is there present an abnormal pigment originating in the body?
3 Is there present extraneous pigment?

**Yellow urines** —Excess of urobilin from haemolysis in pernicious anaemia and acholuric jaundice and in liver disease makes the urine very yellow It froths easily but the froth is not yellow Bile in the urine often gives it

an orange colour and the froth is yellow Large amounts make the urine reddish brown and in long standing jaundice when the pigment is mainly biliverdin the urine is dark green

Riboflavin (vitamin B ) is commonly given in multi vitamin pills and makes the urine very yellow Santonin and chrysophanic acid (from rhubarb and senna) make an acid urine yellow When flavine and picric acid are applied to raw surfaces sufficient may be absorbed to colour the urine more yellow than normal The new anti coagulant phenindione is said to turn the urine a pinkish orange colour

**Red and pink urines** —Uroerythrin usually shows as a pink or brick dust rather than red deposit of urates in cases of congestive cardiac failure Its only importance is that patients may think it is blood Really red urine is generally caused by blood or haemoglobin Both give the chemical and spectroscopic tests for blood but haema turia is distinguished from haemoglobinuria by the presence of red cells and by the fact that filtration largely clears it The experienced eye can detect small quantities of blood in the urine because in addition to the character istic smokiness the meniscus is dark and the urine in the upper part of the vessel is rather pink compared with the rest After standing for some time blood in the urine becomes brownish from the formation of methaemo- globin

Numerous extraneous pigments will colour the urine red A meal of beetroot will do it Eosin in sweets causes the urine to be very pink with a greenish fluorescence Mercurochrome if injected causes red urine Santonin and chrysophanic acid already mentioned will make the urine pink if it is alkaline

A urine of red colour resembling port wine occurs in porphyria either idiopathic or in liver disease and poisoning by barbiturates The urine may be of normal colour when passed but if allowed to stand in the light and especially if acidified a colourless precursor porpho bilinogen is converted into deep reddish brown porphyrin pigments Tests for blood are negative and the abnormal pigment may be identified spectroscopically Porpho bilinogen is identified as follows —To one volume of urine add one volume of Erhlich s aldehyde reagent and allow it to stand for five minutes then add two or three volumes of a saturated solution of sodium acetate Extract with 5 ml of chloroform If the pink colouration remains in the upper aqueous layer it is due to porpho bilinogen while if it is extracted into the lower chloroform layer urobilinogen is present It is essential to neutralise all the hydrochloric acid in the Erhlich s reagent as other wise false positive reactions may be obtained as when indole acetic acid is present and is converted into the pink-coloured urorosein by acid

In cases of obscure abdominal colic the possibility of acute porphyria should be kept in mind The vomiting pain and absence of diarrhoea and rigidity suggest in testinal obstruction Presumably the abnormal pigment stimulates smooth muscle and causes the pain

**Brown and black urines**—It is convenient to consider these in two groups according to whether the urine is black when passed or blackens on standing

1 URINES WHICH ARE BROWN OR BLACK WHEN PASSED —These are usually examples of great excess of pigments of other kinds such as bile and haemoglobin Small amounts of blood in the urine may be converted into acid haematin and give it a brown colour

2 URINES WHICH BLACKEN ON STANDING —Indican which appears in the urine in intestinal stasis and results from bacterial decomposition of protein causes the urine on standing to go dark from the surface downwards A similar appearance occurs in carbolic acid poisoning Really black urine is found in cases of melanotic sarcoma with liver metastases In alkaptonuria a rare inborn error of metabolism homogentisic acid appears in the urine This causes the specimen to darken slowly on standing but it becomes black at once if alkali is added The alkalinised specimen is luminous in the dark Alkapton uria is symptomless for many years but later in life pigmentation of cartilages (ochronosis) and osteoarthritis may appear

**Green and blue urine** —These do not usually cause much trouble The urine in long standing jaundice is often more greenish than yellow and simple tests prove the presence of bile Really blue urine is nearly always due to methylene blue given in pills or sweets When only a little is present the appearance is green and the pigment exists as fine particles and can be filtered off Methylene blue or some similar pigment has occasionally found its way into the urine of children who have sucked some coloured object Quinine in the urine gives it a blue green fluorescence

Lastly it must be remembered that substances other than pigments may alter the appearance of the urine Chyle in the urine from filariasis gives it a milky appear ance as also does an excess of phosphate crystals Occasionally a patient seeks to give his urine an abnormal appearance by adding such things as ink Dettol and condensed milk to it Similar substances can also find their way into the urine from dirty bottles

A urine of red colour resembling port wine occurs in porphyria either idiopathic or in liver disease and poisoning by barbiturates The urine may be of normal colour when passed but if allowed to stand in the light and especially if acidified a colourless precursor porphobilinogen is converted into deep reddish brown porphyrin pigments Tests for blood are negative and the abnormal pigment may be identified spectroscopically Porphobilinogen is identified as follows —To one volume of urine add one volume of Erhlich s aldehyde reagent and allow it to stand for five minutes then add two or three volumes of a saturated solution of sodium acetate Extract with 5 ml of chloroform If the pink colouration remains in the upper aqueous layer it is due to porphobilinogen while if it is extracted into the lower chloroform layer urobilinogen is present It is essential to neutralise all the hydrochloric acid in the Erhlich s reagent as otherwise false positive reactions may be obtained as when indole acetic acid is present and is converted into the pink-coloured urorosein by acid

In cases of obscure abdominal colic the possibility of acute porphyria should be kept in mind The vomiting pain and absence of diarrhoea and rigidity suggest intestinal obstruction Presumably the abnormal pigment stimulates smooth muscle and causes the pain

**Brown and black urines** —It is convenient to consider these in two groups according to whether the urine is black when passed or blackens on standing

1 URINES WHICH ARE BROWN OR BLACK WHEN PASSED —These are usually examples of great excess of pigments of other kinds such as bile and haemoglobin Small amounts of blood in the urine may be converted into acid haematin and give it a brown colour

# CHAPTER IV

## *Treatment*

### DOSAGES OF DRUGS

The doses of most of the commonly used drugs will be found in the accompanying tables (modified from Macgregor and Kinnear 1953) Those of a few as yet proprietary drugs follow and space is allowed for the house physician to add other new ones

Some drug firms still issue their products in Imperial rather than Metric doses but apart from this there is really no justification for retaining Imperial doses As a step towards the universal adoption of the Metric or International system this one alone is used in the dosage table The term Metric system is now strictly a misnomer because the litre and kilogram are measures of volume and mass no longer based on the metre but on artificial standards (albeit almost exactly the same as the original litre and kilogram as planned)

Medicines are frequently prescribed in teaspoon and tablespoon doses Although there is a British Standard Specification for a medicinal teaspoon (60♏ or 3 6 ml (approx 4)) the domestic teaspoon varies from 2 4 to 7 0 ml and so wherever possible it is best to avoid domestic measures and to use a measuring glass

### CONVERSION TABLE FOR WEIGHTS AND MEASURES

| | |
|---|---|
| 1 milligram (mg) | / grain (gr) |
| 15 mg | / gr |
| 60 mg | 1 gr |
| 100 mg (= 0 1 G) | 1 / gr |

## TUBERCULIN TESTS

**Mantoux**—Special all glass syringes are used and preferably a separate one for each strength of tuberculin As it is very difficult to rid them of tuberculin it is most important that they should not be used for any other purpose Inject intra-dermally into the forearm 0 1 ml of tuberculin If active tuberculosis is a possibility start with 1 in 10 000 dilution A patient is not Mantoux negative unless he fails to react to 1 in 100 tuberculin Read the result not earlier than forty-eight hours and preferably seventy two hours after injection A positive result shows an area of oedema 5 mm or more in diameter An area of redness without oedema is not significant *Note*—Saline dilutions of old tuberculin are only stable for a few days It is best to make them up freshly Dilutions with a borate buffer do not deteriorate for three months

**Patch test**—Cleanse the skin between the scapulae with ether and apply the patch Avoid washing the back Remove the patch after forty eight hours and read the result twenty four hours later The centre square is the control The skin under it remains normal The lateral squares show redness induration and vesicles if the test is positive

## CHAPTER IV

# *Treatment*

### Dosages of Drugs

The doses of most of the commonly used drugs will be found in the accompanying tables (modified from Macgregor and Kinnear 1953) Those of a few as yet proprietary drugs follow and space is allowed for the house physician to add other new ones

Some drug firms still issue their products in Imperial rather than Metric doses but apart from this there is really no justification for retaining Imperial doses As a step towards the universal adoption of the Metric or International system this one alone is used in the dosage table The term Metric system is now strictly a misnomer because the litre and kilogram are measures of volume and mass no longer based on the metre but on artificial standards (albeit almost exactly the same as the original litre and kilogram as planned)

Medicines are frequently prescribed in teaspoon and tablespoon doses Although there is a British Standard Specification for a medicinal teaspoon (60m or 3 6 ml (approx 4)) the domestic teaspoon varies from 2 4 to 7 0 ml and so wherever possible it is best to avoid domestic measures and to use a measuring glass

### Conversion Table for Weights and Measures

| | |
|---|---|
| 1 milligram (mg ) | $^1/_{60}$ grain (gr ) |
| 15 mg | $^1/$ gr |
| 60 mg | 1 gr |
| 100 mg (= 0 1 G ) | 1 / gr |

| | |
|---|---|
| 0 1 millilitre (ml ) | 1½ minims (m ) |
| 0 3 G and 0 3 ml | 5 gr and 5 m |
| 0 5 G and 0 5 ml | 8 gr and 8 m |
| 1 G and 1 ml | 15 gr and 15 m |
| 30 G and 30 ml | 1 oz and 1 fl oz |
| 600 ml (approx ) | 1 pint |
| 1 Kg | 2 2 lb |

### ABBREVIATIONS

SC = Subcutaneous injection
IM = Intramuscular injection
IV = Intravenous injection
PR = Prophylactic dose
TH = Therapeutic dose
IN = Initial dose
SUB = Subsequent doses
S = Single dose
S(R) = Single dose—usually repeated two or three times in the day
D = Daily dose
D/ = Daily total in divided doses
W = Weekly dose

The route of administration is by mouth unless another route is indicated

The doses in the table are for an adult and in general are taken from the British Pharmacopœia 1953 A few non-official drugs are included and are distinguished by the square brackets [ ] enclosing the name of the drug Although proprietary names should be avoided a few popular ones are added in brackets They are intended to assist the house physician to note and learn the approved names

| NAM OF D UG | ROUTE O AD IINI TRA TION | DO E | REMARK |
|---|---|---|---|
| A tylsali yl c d (Asp n ) | | 0 3 t 1 G | S(R) |
| Adr al nj ct n (1 1 000 sol tion) | SC | 0 to 0 ml | S(R) |
| Am ophylh | IV or IM | 0 1 to 0 5 G | S(R) |
| | per r t m ( ppos t ry) | 0 1 t 0 5 G | S |
| Amm n m chl nde | | 0 3 to 4 G | S(R) |
| Amph tamme s lph t | | 5 t 10 mg | S(R) |
| [Amyl barbit e (B P C)] (S 4) (Amyt l) | | 0 1 t 0 3 G | S |
| A e n e hyd ochl nde | | t 5 mg | D PR |
| | | 5 t 50 mg | D TH |
| As orbi acid | | 5 t mg | D PR |
| | | 200 t 500 mg | D TH |
| Atrop s lph t | C | 0 t 1 mg | S |
| A eomy n | | 1 to G | D/ B P (1953) dos H gh d g ft n q d |
| Barb t (S 4) | | 0 3 t 0 6 G | S |
| Bellado n t tur f | | 0 6 to 2 ml | S(R) |
| [B t barb t (B P C N F)] (S 4) (S ryl) | | 100 to 00 mg | S |
| Calciferol | | 0 0 t 0 1 mg (1 000 t 4 000 ts) | D PR |
| | | 0 1 t 1 mg (5 000 t 50 000 t ) | D TH |
| Calcium gl o t | | 1 t 4 C | S(R) |
| Cal m gl n te nj tio | IV IM | 1 t G | S |
| Cal m lact te | | 1 t 4 C | S(R) |
| Carba h l | SC | 0 t 0 mg | S |
| [Ca bimaz l ] (N o c 1 ) | | 0 t 4 mg | D troll g dos |
| | | t 10 mg | D m t dos |
| Carbo t tr hlorid | | t 4 l | S |
| Casca s grad l q d tr ct of | | t 4 ml | S |
| Cas ra sagr da, dri d xtr t of | | 0 1 t 0 5 G | S |
| Cast oil | | 4 t 16 ml | S |
| Chl l hydr t | | 0 3 t G | S |
| Chloramp l | | 1 5 t 4 G | D/ |
| Cy oc balam n ( t m B1 ) | IM | 0 t 100 m crogramm | W IN |
| | | 0 t 100 m crogrammes ry tw t three w ks | SUB |

| NAME OF DRUG | ROUTE OF ADMINISTRATION | DOSE | REMARKS |
|---|---|---|---|
| [Cyclobarb ton (B P C)] (S 4) (Phanodorm) | | 200 t 400 mg | S |
| Deo ycortone cet te | Impl t | 0 1 to 0 4 G | |
| | IM | ° to 5 mg | D |
| D xamphet mine S lphate (B P C) (D xedrine) | | to 10 mg | |
| Dienoest ol | | 0 to 10 mg | D |
| D gital prepared | | 30 to 100 mg | S(R) 100 mg powde ed l af = 0 mg d g approximately |
| D g n | | 1 to 1 mg | D/ ull digital sed |
| | | 0 ̵ to 0 mg | D ma t nance dose |
| D gox n i j ct on | IV | 0 t 1 mg | S |
| D m cap ol (BAL) | IM | °00 mg | D' |
| [D phe hyd ami e] (S 4) (B nadryl) | | 50 to 100 mg | S(R) |
| Emetine and b m th d de | | 60 t 00 mg | D |
| Emet ne hy lro hloride | IM SC | 30 to 60 mg | D |
| Eph drin hydrochloride | | 1 to 60 mg | S(R) |
| E g metri male te | | 0 ̵ t 1 mg | S |
| Ergotam ne t rt at (F m g ) | | 1 t mg | S |
| | SC IM | 0 ̵ t 0 mg | S |
| Eth nylo trad l | | 10 t 100 m rogrammes | D |
| Eth terone | | ̵ to 100 mg | D |
| Ethyl b sc m et t (Tr m x ) | | 0 f t 1 G | D IN |
| | | 0 1 t 0 9 C | D' SUB (dos g d p nds p o th mb n a t ty) |
| Fol c a d | | t °0 mg | D |
| Glyceryl trin trat | S bl g al | 0 5 t 1 mg | S(R) |
| Heparin | IV | 6 000 t 1 ̵00 nit | S(R) |
| [He ameth m b tartrat ] | SC IM | °0 to 7 mg | S |
| Hyos n h dr b om d | SC | 0 3 t 0 6 mg | S |
| In l n | SC IM IV | Dos t b d t m n d by the phys n in o d w th th d of th p t t | |
| Soluble ins l | | (Cont 20 40 or 80 t per ml ) | |
| Prot m ne z c l | | (C nt 40 80 n ts p r ml ) | |
| Glob n sul n | | (C nta 40 or 80 ts p ml ) | |
| I l zi c suspens ns | | (Co t n 40 o 80 u t pe ml ) | |
| Iro — | | | |
| Ferric amm ni m c t at | | 1 t 3 G | S(R) |
| [Ferro s gl c n t ] | | 0 3 t 0 6 G | S(R) |

| Name of Drug | Route of Adm n stra t on | Dose | Remarks |
|---|---|---|---|
| Iro —c td | | | |
| F rro s ulph t siccated | | 60 t 00 mg | S(R) |
| [S harat d o de ] t ] | IV | 50 t 100 mg | D |
| [I n d xtr n c mplex] (Imfer ) | IM | 100 to 00 mg | S |
| Isopr nal s lphat (Ne Ep ni ) | S bl gual | t 0 mg | S(R) |
| M gnes m sulphate | | t 16 G | S |
| M gn si m tri l c te | | 0 3 t G | S(R) |
| Mal f rn l q d tra t f | | 3 t 6 f l | S |
| M phth | IM | 1 t mg | D |
| Mep ri hyd hl rid | | 0 1 G | D PR |
| | | 0 t 0 G | D TH |
| [Meph es (B P C)] | | 0 t 1 G | S(R) |
| M pyram male t (S 4) (Anthis ) | | 0 3 t 0 8 G | D |
| M rsal l nj t | IM | 0 to ml | S |
| [Meth h l h l d (B P C)] (Mech lyl) | | 100 t 00 mg | S |
| | C | 10 t 0 mg | S |
| M tl d hyd hl rid (D D A) | | t 10 mg | S |
| M thylpl ba b t (S 4) (Ph m t ) | | 60 t 00 mg | D |
| Methylth l | | 00 t 600 mg | D t ll g d |
| | | 0 t 00 mg | D m t d e |
| M rphi lph te (D D A) | IV IM SC | 8 t 0 mg | S |
| Neo rspl n mi | IV | 0 1 t 0 6 G | W |
| Neostigm m thyl lph t | | 1 t 60 mg | S(R) |
| Nic t m d | SC IM | 0 t mg | S(R) |
| | | 1 t 30 mg | D PR |
| | | 0 t 0 mg | D TH |
| Op m ti t f (D D A) | | 0 3 t ml | S |
| O bai | IV | 0 1 t 0 mg | S |
| [O ytet cy l ] (Terr my ci ) | | t 6 C | D |
| Oxytoc l t | SC IM | 0 t 0 ml | S |
| P m qui | | 10 t 0 mg | S R) |
| P ra-am o-sal yl t dium (B P C)] | | 1 t 0 C | D/ |
| P raffin l q d | | 8 t 30 ml | S(R) |
| Parald hyd | | t 8 ml | S |
| | IM | t 8 ml | S |
| P cill | IM | D t b d t rm d by th phys a rd with th d f the pat t | |

| NAME OF DRUG | ROUTE OF ADMINISTRATION | DOSE | REMARKS |
|---|---|---|---|
| Pen callin—contd | | | |
| Crystallin b n ylpen llin Proca ne be lyp nicillin with benzylpen c llin nj ct on | | (Conta ns 300 000 ts f proc benzyl p c ll n pl s 100 000 un ts be z l-en cillin per ml ) | |
| P ntob rb tone sod um (S 4) (Nemb tal) | | 0 1 t 0 G | S |
| Pethidin hydrochlor d (D D A) | | .. to 100 mg | S |
| | IM IV | .. to 100 mg | S |
| Ph n cetin | | 0 3 to 0 6 G | S(R) |
| Phen nd e (D ndev ) | | 1.0 t 00 mg | IN |
| | | 50 t 100 mg | SUB (dos g depends on p th mbin act v ty) |
| Phen barb t ne (S 4) | | .0 t 1?0 mg | S(R) |
| Phenyt in s d m | | 50 t 100 mg | S(R) |
| P crot in | IV | 0 6 t 6 mg | Dos g m t be gauged by resp nse f p t ent |
| Pota s m chloride | | 1 to G | S(R) |
| Pot s im c t at | | 1 to G | S(R) |
| P tas ium odid | | 30 to 60 mg | D Thyro o cosis |
| | | 0 3 to G | Other ndit |
| [Prim d n ] (Mysol ne) | | 0 7 t 1 5 G | D |
| P gu n l | | 0 1 t 0 4 G | D |
| Prometbaz ne (S 4) | | to mg | D |
| Propylth ra il (S 4) | | 200 t 600 mg | D contr ll ng dose |
| | | to 200 mg | D ma t n ce dose |
| [Protam n s lph t ] | IV | 0 t 100 mg | |
| Qu nalbarb t s dium (S 4) (S conal) | | 50 t 200 mg | S |
| Quin dine sulph te | | 60 t 300 mg | S R) |
| Q ne hydr hloride | | 0 3 t 0 6 G | S(R) |
| Rib fl ne | | 1 t 4 mg | D PR |
| | | t 10 mg | D TH |
| Sant nin | | 60 t 200 mg | S |
| S nna, Liq d extr t f | | 0 6 t ml | S |
| Sodium a th om l te | IM | 10 t 100 mg | S (t t l dos g not eed g 1 G) |
| Sod um b arbon te | | 1 t 4 G | S R) |
| Sod m al cyla e | | 0-6 t G | S(R) |
| Stilboestrol | | 0 1 t 5 mg | D |
| S rept my in | IM | 1 G | D |
| Succ nyl ulphathiazol (S 4) | | 3 t 6 G | S(R) |
| Sulphad az ne (S 4) | | 3 G | IN |
| | | 1 t 1 G | SLB ( ery four h rs) |

| Name o Drug | Ro te of Admin stra tion | D e | Rem rks |
|---|---|---|---|
| S lphadimidin (S 4) | | 3 G<br>1 t 1 G | IN<br>SUB ( ry six h rs) |
| Sulph dim d e di m ject (S 4) | IV | 1 t G | S |
| Test st | Impl t | 0 1 t 0 6 G | |
| Test tero e p op onate ) n | IM | t mg | D |
| Thi p t n di m (S 4) | IV | 0 1 t 0 5 G | S |
| Thyr d | | 30 t 40 mg | D |
| [T 1 h hydro hl rid (B P C.)] (Pris l) | IM IV | 5 t 50 mg<br>10 t 0 mg | S(R) |
| T xido (S 4) (Trid e) | | 1 t G | D/ |
| Vas p ess inj t n | SC IM | 0 t 0 7 ml | S |
| V t min A—<br>Halib t l v oil | | 0 06 t 0 3 ml (1 500 t 7 00 ) | D |
| Co t at d s l t n | | 0 06 t 0 6 ml ( 500 t 5 000 ) | D |

Drugs which are subject to the regulations of the Dangerous Drugs Acts and those which are classified as Schedule 4 Poisons are indicated by the abbreviations (D D A ) and (S 4) respectively

## Newer Drugs

Diamox (Lederle) (Acetazoleamide) (Non mercurial oral diuretic) —250 mg (1 tablet) each morning

Largactil (May and Baker) (Chlorpromazine) —25 to 50 mg (1 or 2 tablets) three times a day

Eumydrin (Bayer) (Atropine methonitrate B P C ) —0 6 per cent alcoholic solution 2 drops before each feed for pyloric spasm in babies

Piperazine (Entacyl British Drug Houses) for thread worms 300 mg tablets Dose Children up to 6 years — 1 tablet per day per year of life over 6 years —2 tablets

# Notes

three tımes a day Seven days treatment Repeat after one week s rest ıf necessary

Vıtamın $K_1$ (Konakıon Roche) 10 mg ın gelatın capsule The dose ıs squeezed out ınto some orange juıce and swallowed Also supplıed ın 50 mg ampoules (Mephyton Merck) for ıntravenous use

## ANALGESIC DRUGS

Mıld ones lıke aspırın and Compound Tablets of Codeıne B P ( Veganın ) should be trıed first

**Morphıne** (D D A ) ın doses of 10 to 30 mg (gr $^{1}/$ to $^{1}/$ ) by subcutaneous ınjectıon ıs the drug of choıce for severe paın If ıt causes vomıtıng Dılaudıd may be used ınstead

**Dılaudıd** (dıhydromorphınone) (D D A ) The dose ıs about $^{1}/_{5}$ that of morphıne *ı e* 2 mg (gr $^{1}/_{3}$ ) ıs equıvalent to 10 mg (gr $^{1}/_{6}$) morphıne It causes fewer sıde effects than morphıne

**Omnopon** (Roche) (Papaveretum B P C ) (D D A ) 20 mg (gr $/_{3}$) = Morphıne 10 mg (gr $^{1}/_{6}$)

**Nepenthe** (D D A )—a lıquıd preparatıon of opıum Dose 0 3 to 2 5 ml (♏ 5 to 40 approx ) 1 5 ml (♏ 25) has the same effect as morphıne 15 mg (gr $^{1}/$ )

**Physeptone** (Amıdone) (D D A ) Dose 5 to 10 mg 30 mg ıs the upper lımıt An analgesıc wıthout the sedatıve effect of morphıne 12 mg has the same effect as morphıne 15 mg (gr / )

**Dromoran** (Methorphınan) (D D A ) Dose 1 5 to 4 mg by mouth or by ınjectıon A powerful analgesıc wıth less hypnotıc effect than morphıne (*Note* —It precıpı tates ıf mıxed wıth thıopentone)

**Pethidine** (D D A) Dose 50 to 150 mg 250 mg is the usual upper limit It has an action midway between aspirin and morphine and also spasm relieving properties in the colon uterus and ureter 125 mg has the same effect as morphine 15 mg (gr $^1/_4$)

## SEDATIVES AND HYPNOTICS

During his term as house physician the young doctor has an excellent opportunity of learning at first hand the way to use sedative drugs He will be wise to become really familiar with a small number and to avoid proprietary combinations of sedatives and analgesics The following are suggested (oral doses for adults and duration of effect is shown)—

**Phenobarbitone** (Luminal) (S 4) and Phenobarbitone sodium (S 4) (soluble) 30 to 120 mg ($^1/_2$ to 2 grains) 8 to 16 hours

**Barbitone Sodium** (Medinal) (S 4) 0 3 to 0 6 G (5 to 10 grains) 8 to 16 hours

**Amylobarbitone** (Amytal) (S 4) 45 mg ($^3/_4$ grain) as sedative 90 to 300 mg ($1^1/_2$ to 5 grains) as hypnotic 4 to 8 hours

**Butobarbitone** (Soneryl) (S 4) 60 to 120 mg (1 to 2 grains) 4 to 8 hours

**Pentobarbitone** (Nembutal) (S 4) 90 to 180 mg ($1^1/_2$ to 3 grains) 4 to 8 hours

**Chloral hydrate** 0 3 to 1 8 G (5 to 30 grains) $^1/_2$ to 4 hours

Chloral draught B P C —Chloral Hydrate 1 2 G (gr 20) Liquid Extract of Liquorice 2 ml (♏ 30) Water to 45 ml ($^1/_2$ fl oz)

**Paraldehyde** 2 to 8 ml (30 to 120 ♏) A very safe hypnotic Effect comes on in twenty minutes and lasts several hours

Paraldehyde draught B P C—Paraldehyde 4 ml (♏ 60) Syrup 8 ml (♏ 120) Liquid Extract of Liquorice 3 ml (♏ 45) Water to 45 ml (1½ fl oz)

By intramuscular injection 5 to 10 ml for adults By rectum 0 3 ml per Kg (♏ 30 per stone) as a 1 in 10 solution in physiological saline

*Note*—Barbiturates chloral and paraldehyde have no analgesic effect

## Sedatives for Children

**Chloral hydrate**—This is most useful for the newborn and for tiny infants Give 60 mg (1 grain) as a single dose for a small baby and 60 mg (1 grain) before each feed (maximum 0 3 G (5 grains) in twenty four hours) for larger babies

*Note*—Don t use neat Syrup of Chloral B P C for children as 4 ml (60 minims) of it contains 0 6 G (10 9 grains) of chloral

Chloral is often combined with bromide *e g* Chloral and Potassium Bromide Mixture for Infants B P C—Syrup of Chloral 0 6 ml (♏ 10) Potassium Bromide 150 mg (gr 2½) Liquid Extract of Liquorice 0 2 ml (♏ 2½) Glycerine 0 6 ml (♏ 10) Water to 4 ml (♏ 60) (this dose contains about 1⅘ grains (approx 100 mg) of chloral hydrate)

**Paraldehyde**—2 to 4 ml intramuscularly for con vulsions By rectum ♏ 30 per stone in physiological saline (Solubility 1 in 10 *i e* ♏ 60 in 1 fl oz or 4 ml in 30 ml)

**Aspirin** —0 2 G (gr $2^1/_2$) acts as a sedative in small children

**Pentobarbitone** —(Nembutal) (S 4) 6 mg per Kg (gr $^3/_8$ per stone) Maximum dose 180 mg (3 grains)

**Quinalbarbitone** —(Seconal) (S 4) 8 mg per Kg (gr $^1/_4$ per stone) Maximum dose 180 mg (3 grains) Sup positories contain 120 mg (2 grains)

**Injection of Papaveretum B P C** — (Omnopon) (D D A ) 0 06 ml (one minim) per year of age

### RECTAL THIOPENTONE FOR CHILDREN

The dose is 20 mg per pound body weight The maximum dose is 1 G irrespective of body weight A small enema should be given if the child is constipated and then no food for three hours Give atropine 0 4 to 0 6 mg (gr $^1/_{150}$ to $^1/_{100}$) subcutaneously half an hour before the thiopentone to prevent salivation Dissolve 0 5 or 1 0 G of thiopentone in 20 to 40 ml of tap water and take up the appropriate amount into the syringe Tell the child that he is just having another enema or that he is having his temperature taken and inject the dose slowly into the rectum through a small catheter Strap the buttocks together Should some of the solution be returned give half the original dose half an hour later The child will be very drowsy within half an hour Have oxygen and a sucker and nikethamide ready in case of excessive seda tion This method is very useful for such procedures as lumbar puncture chest aspiration and ophthalmoscopy It is not contraindicated by the fact that the child is seriously ill

### PRESCRIPTIONS

Only prescribe by title preparations of the current B P and the current National Formulary Prescriptions not in these publications should be avoided if possible Other prescriptions should be written legibly in full and pre ferably in English Roman numerals and the signs ʒ and ℥ should be avoided Use ♏ 60 for ʒj and 1 fl oz for ℥j when prescribing in the Imperial system In the Metric system conform to B P practice and prescribe milli grammes for any amount less than 0 1 G Always put the child s age on his prescription so as to emphasise to the pharmacist that the medicine is intended for a child

### POISONS AND DANGEROUS DRUGS

Prescriptions for Dangerous Drugs (opium etc cocaine cannabis indica pethidine physeptone heroin) and Schedule IV poisons (sulphonamides barbiturates etc ) must show the name and address of the patient the total quantity of drug or preparation to be supplied the date and the doctor s signature and address For patients in hospital addresses are unnecessary and the doctor s initials instead of his signature are acceptable Only private prescriptions can carry instructions to repeat and then only twice (*i e* three dispensings in all) the pre scription being retained by the pharmacist

### DANGEROUS COMBINATIONS OF DRUGS

Avoid blunderbuss therapy and remember that drugs innocuous in themselves may prove dangerous in com bination Examples are calcium and digitalis (intravenous calcium in a digitalised patient may cause death from ventricular fibrillation) adrenaline and chloroform or trilene anaesthesia morphine and barbiturates

## ANTIBIOTIC DOSAGE

Prescribing rules for antibiotics are the same as for Schedule IV poisons All antibiotics except penicillin are prescribed by weight It is undesirable however to try to alter the established practice of prescribing penicillin in units and there is the additional difficulty that 1 mg of different preparations does not contain the same number of units (procaine penicillin 1 000 units and crystalline sodium penicillin 1 600 units per mg)

**Penicillin by injection**—*Crystalline* penicillin (Benzyl penicillin or Penicillin G sodium salt) Usual adult dose 500 000 units twice a day

Procaine penicillin (Distaquaine Seclopen) Daily dose is 300 000 units fortified with 100 000 units benzyl penicillin Intramuscular *only*

Penethamate hydriodide (Estopen) 1 mega unit daily

Dibenzylethylenediamine dipenicillin G (DBED) 300 000 units every three days

Penidural all purpose penicillin—When reconstituted with 1 5 ml water one dose yields

600 000 units of DBED dipenicillin G
300 000 units of Procaine penicillin G
300 000 units of Potassium penicillin G
with sodium citrate buffer

This single dose is said to be enough for most infections (except bacterial endocarditis)

**Penicillin by mouth.**—DBED dipenicillin G (Penidural) 300 000 units in 5 ml every six hours Oral tablets contain 200 000 and 400 000 units of crystalline penicillin Five times the intramuscular dose every three hours is advised

**Penicillin by inhalation** —Use 1 to 2 ml of a solution containing 100 000 units per ml in fifteen minutes

**Streptomycin** —Total daily dose of streptomycin and dihydrostreptomycin is 1 to 2 G intramuscularly Intra thecal dose 25 to 100 mg Oral dose 2 to 4 G daily (bowel infections only not absorbed)

**Chloramphenicol** —50 mg per Kg daily in divided dosage by mouth 250 mg capsules For deep intra muscular injection use a solution of 250 mg per ml in dimethylacetamide If used intravenously it must be diluted first by injecting 2 ml slowly into 100 ml of physiological saline with the needle point below the surface Dilution in the ordinary way may cause pre cipitation

**Chlortetracycline (Aureomycin)** —12 5 to 20 mg per Kg daily in divided dosage (up to 1 5 G a day for an adult) For intravenous injection use 10 ml of physio logical saline to dissolve 100 mg of buffered powder and then dilute so that there is 1 ml of saline for each mg of aureomycin Stronger solutions are very apt to cause thrombosis Intramuscular injection is painful and should be avoided

**Oxytetracycline (Terramycin)** —By mouth 1 to 2 G a day for adults and 20 to 40 mg per Kg for children Intramuscularly about 0 5 G a day for adults

**Erythromycin** —By mouth up to 2 G a day for adults and 30 mg per Kg per day for children

**Tetracycline** —By mouth or intravenous drip for adults 1 to 2 G a day and for children 10 to 20 mg per pound per day

**Sulphonamide dosage** —The maximum safe daily dose for an adult is 10 G and for the smallest infant 2 G provided urinary output is adequate (1 500 ml a day for an adult) Gantrisin (sulphafurazole) is effective in doses as small as 6 G daily With Urolucosil (sulphamethizole) *1 G a day is sufficient (0 1 G tablets)* The poorly absorbed sulphonamides (phthalyl sulphathiazole) may be given in doses of 20 G a day or more

### Cost of Antibiotics

The house physician should be aware of the cost of the antibiotics he prescribes In many hospitals they account for up to half of the drug bill and there is reason to believe that they are often prescribed excessively or unnecessarily The price of those under Ministry control is confidential but it can be stated that whereas three days *treatment with penicillin one mega* unit a day costs 4/6d treatment by daily dosage of 1 5 G for three days with aureomycin or terramycin costs hospitals six times as much and with erythromycin nearly ten times as much Sulphonamide dosage costs less than antibiotic dosage 100 tablets of sulphathiazole (0 5 G each) for example costs 5/3d

### Antibiotic Antagonism

Penicillin and streptomycin are primarily bactericidal and their effects synergistic (particularly against *Streptococcus faecalis*) Aureomycin chloramphenicol and oxy tetracycline are primarily bacteriostatic and the effect of combining them simply additive Combinations of bactericidal and *bacteriostatic antibiotics are* usually antagonistic when the organism is very sensitive to the bactericidal drug because the growing forms on which

the bactericidal drug would act are suppressed If an organism is not very sensitive to penicillin and strepto mycin then the effect of adding aureomycin chlor amphenicol and oxytetracycline is synergistic Although sulphonamides are bacteriostatic they enhance the effect of penicillin and streptomycin because their activity is very dependent on the number of organisms present Penicillin and streptomycin reduce the numbers of organisms to a level at which sulphonamides are most effective Antagonism does not present a problem with the broad spectrum antibiotics but it is best to use one of them and await sensitivity tests

## Certain Urgent Conditions

The following notes are provided in the hope that they may help to avoid the feeling of helplessness which may overcome the young house physician when faced with certain situations requiring immediate action

### Sudden Dyspnoea

Common causes are —

(1) **Left ventricular failure** as in hypertension and coronary disease Lungs full of moist sounds May be pink frothy sputum Sit the patient up give morphine 10 to 30 mg (gr $^1/_6$ to $^1/$ ) subcutaneously perform vene section and administer oxygen Other remedies are aminophylline 0 5 G diluted intravenously mersalyl 2 ml *intramuscularly* and digoxin 1 mg diluted in 10 ml of physiological saline intravenously

(2) **Pneumothorax** —The side of the chest is resonant silent and immobile Give a barbiturate and oxygen If distress persists put a needle into the sixth space in the

mid axillary line to release the tension Remove the air by a reversed pneumothorax apparatus Leave the needle in place and connect it to rubber tubing which dips under water

(3) In a comatose patient think of **diabetic ketosis** (*see page* 141) and **aspirin poisoning** (*see page* 145)

(4) **Hysterical hyperpnoea**

## The Acute Abdomen

The house physician may expect to be suddenly faced with the acute abdomen in the casualty department but may take the view that nothing like that can happen in his own domain These comments are provided to help him refute the gibe that the worst place to perforate is in the medical ward The main pitfall to avoid is to call the surgeon too late

Many abdominal pains are medical in origin but when they last longer than six hours they are generally caused by a surgical condition A medical and a surgical cause may coincide Pneumonia can occur with appendicitis and coronary occlusion with cholecystitis So do not be lulled by the original diagnostic label but examine the patient afresh flat in bed and bare from breast to thigh If he cannot raise himself without using his arms an acute abdomen is likely Palpate the abdomen with the flat of the warm hand examining the place complained of last of all Note any tenderness or rigidity and watch the mobility of the chest wall If it is fixed or recedes on inspiration peritoneal irritation is suggested Examine the chest (for pneumonia) the gums for blue line (lead colic) and the knee jerks and pupils (for tabes) Don t forget the hernial orifices and rarely omit a rectal examination

If you are still in doubt obtain a surgical opinion via your opposite number He may find what you have missed but it is better to be humiliated at the bedside early than when it is too late for the patient s life to be saved

## Status Asthmaticus

Remember that All is not asthma that wheezes

Useful remedies

1 Injection of Adrenaline B P 0 06 ml (1 minim) every thirty seconds subcutaneously 8 ml (120 minims) may be needed so strap the needle to the skin
2 Aminophylline 0 25 to 0 5 G intravenously slowly
3 Paraldehyde up to 5 ml for an adult intramuscularly
4 A C T H 25 mg every four hours intramuscularly

Beware of morphine in asthma

## Haematemesis and Melaena

Reassure the patient and give him morphine 10 mg (gr 1/6) If shocked raise the foot of the bed and give oxygen by mask at 6 litres per minute

Order an hourly pulse chart

Take blood (oxalated) for Hb estimation and (in a plain tube) for grouping

Allow dilute saline by mouth and soon go on to semi solid food

Drip blood transfusion if Hb below 50 per cent or the patient is severely shocked Call a surgeon if shocked aged over 50 or if bleeding is recurrent but don t delay calling him until the patient is at his last gasp

## PAROXYSMAL TACHYCARDIA

| | AURICULAR TACHYCARDIA | AURICULAR FLUTTER | VENTRICULAR TACHYCARDIA | REMARKS |
|---|---|---|---|---|
| Age at onset | *Before 40* | After 40 | After 50 | |
| Ventricular rate | Over 160 | Under 160 | Over 180 | Higher rates are against *flutter* and *in favour* of auricular and ventricular tachycardia |
| Ventricular rhythm | Regular | Regular with occasional *interruption* | Very slight arrythmia | Measure *rate and rhythm* by auscultation and not palpation because of pulse deficit |
| Duration | 1 2 hours or 2 3 days at most | A day or two | Several days | |
| Previous attacks | *Frequent* | Common | Exceptional | |
| Carotid sinus stimulation | May abolish attack or be without effect | Induces a temporary irregular ventricular *rhythm* Tachycardia returns after transient slowing | No effect | |
| Heart muscle | Healthy | Slightly damaged | Usually grossly damaged | |
| Associated conditions | Mitral stenosis | Induces auricular fibrillation | 1 Myocardial infarction<br>2 Over digitalisation | Paroxysmal |
| Digitalis | May abolish abruptly | Coronary sclerosis common | Aggravates and is contraindicated | Tachycardia |

### PAROXYSMAL TACHYCARDIA

The table on *page* 126 (from Emergencies in Medical Practice) will help the house physician to decide the type and treatment An E C G should be arranged

### CEREBRAL MALARIA

Always suspect this in a seaport town if a seaman is brought with headache drowsiness and delirium Take thick and thin blood films (*see page* 70) Give Quinine bihydrochloride 0 5 G intravenously slowly and preferably in 300 ml (10 fl oz) of dextrose saline Repeat six hourly until able to swallow

### ARTERIAL OCCLUSION

Arterial embolism is shown by sudden pain pallor and paralysis of a limb in a patient with mitral stenosis or other source of an embolus Arterial thrombosis being slower is less likely to cause pain

Don t delay Give pethidine 100 to 150 mg subcutaneously (not into the affected limb) for pain if necessary Give papaverine 30 to 60 mg (1/ to 1 grain) intravenously and tolazoline (Priscol) 25 mg intravenously Give whisky or brandy in liberal doses

All these measures aim at causing dilatation of collaterals Forbid smoking which might have the opposite effect

Don t elevate the limb This would hinder its blood supply Don t warm the limb but leave it exposed at room temperature This reduces its oxygen requirements Put a glove on the opposite hand and a bedsock on the opposite foot and let the patient wear his bed jacket These measures may release vasoconstriction reflexly Start anticoagulant therapy with heparin 15 000 units

## Paroxysmal Tachycardia

| | Auricular Tachycardia | Auricular Flutter | Ventricular Tachycardia | Remarks |
|---|---|---|---|---|
| Age at onset | Before 40 | After 40 | After 50 | |
| Ventricular rate | Over 160 | Under 160 | Over 180 | Higher rates are against flutter and in favour of auricular and ven tricular tachycardia |
| Ventricular rhythm | Regular | Regular with occasional interruption | Very slight ar rythmia | Measure rate and rhythm by auscultation and not palpation because of pulse deficit |
| Duration | 1 2 hours or 2 3 days at most | A day or two | Several days | |
| Previous attacks | Frequent | Common | Exceptional | |
| Carotid sinus stimulation | May abolish attack or be without effect | Induces a temporary irregular ventricular rhythm Tachycardia returns after transient slowing | No effect | |
| Heart muscle | Healthy | Slightly damaged | Usually grossly damaged | |
| Associated conditions | Mitral stenosis | Induces auricular fibrilation | 1 Myocardial infarction 2 Over digitalisation | Paroxysmal |
| Digitalis | May abolish abruptly | Coronary sclerosis common | Aggravates and is contraindicated | Tachycardia |

obvious septicaemia penicillin and cortisone should be used also

**Pneumococcal meningitis** —Give one intra thecal injection of crystalline penicillin G 25 000 units in 5 ml of water and 2 to 4 mega units four hourly intramuscularly with sulphadiazine as in meningococcal meningitis

**Streptococcal and staphylococcal meningitis** —Treat as for pneumococcal meningitis but if the organism is penicillin resistant then use chloramphenicol (as in *H influenzae* meningitis) and sulphadiazine (as in meningococcal meningitis)

*Haemophilus influenzae* **meningitis** —Chloramphenicol 50 mg per Kg in twenty four hours by mouth is the drug of choice For children the tasteless chloramphenicol palmitate (250 mg in 8 ml ) is best Streptomycin should be avoided as it may quickly cause deafness in sensitive patients but one or two doses (25 to 50 mg in 3 to 5 ml of saline every twenty four hours) may be given intra thecally if there is vomiting

**Tuberculous meningitis** —The C S F will clearly indicate a meningitis but it will be sterile and the problem is to distinguish between tuberculous meningitis non paralytic poliomyelitis meningitis following an infectious fever and lymphocytic chorio meningitis (*see pages* 93 and 94) If there is doubt it is best to play for safety and start treatment as for tuberculous meningitis with streptomycin 20 mg per pound daily by intramuscular injection (none intrathecally) and I N A H 5 mg per pound daily by mouth

## EPISTAXIS

Bleeding from the nose only becomes a job for the doctor when it won t stop Sometimes this is because of in

intravenously and phenindione 200 mg by mouth Notify your senior so that a surgeon may be consulted

## STATUS EPILEPTICUS

Give paraldehyde 5 ml (from an ampoule but if need be straight from the bottle) intramuscularly and repeat if necessary in half an hour The fits must be stopped and should paraldehyde fail thiopentone intravenously or chloroform by inhalation may be used

## MENINGITIS—WHICH DRUG TO USE?

Once the question of meningitis has seriously crossed your mind you must do a lumbar puncture Which drug to use will depend on the CSF findings Avoid intrathecal treatment if possible and *never inject any sulphonamide intrathecally* Sulphadiazine and chloramphenicol are the two substances which penetrate best into the CSF Practically no Terramycin (oxytetracycline) when given by mouth will reach the CSF

The following notes are provided to help you to decide which drug to use Until an organism is revealed you will have to rely on clinical judgment and the other CSF findings If the CSF is normal treat the condition—usually pneumonia—which is causing meningitic symptoms (meningism)

**Meningococcal meningitis** —Give sulphadiazine in full dosage (2 G a day for the smallest child and 10 G a day for an adult) If vomiting precludes oral administration the first doses of sulphadiazine sodium may be given well diluted by intravenous injection An adult must take 6 pints of fluid in twenty four hours and a child 1 pint for each gramme of sulphadiazine given When there is

has had a tooth extracted during the previous twenty four hours and is still bleeding

Reassure the patient and if necessary give him a sedative Clear the mouth of loose clots using cotton wool and physiological saline Verify the site of bleeding Make a roll of gauze like a cigar and put it across the socket Tell the patient to bite on this A bandage may be used to keep the jaws together After twenty minutes remove the gauze gently This is usually all that is necessary as the bleeding was capillary in origin If bleeding continues there is probably some periosteal separation Anaesthetise the gum on either side with 2 per cent procaine and put in a horizontal suture of nylon or silk to draw the gum margins together Should this fail you should seek help from your senior colleague

## The Fixed Wedding Ring

The house physician may have to do evening casualty duty and he may be faced with a woman who cannot remove her ring from her swollen finger It is a pity (and difficult) to cut the ring and the following little known simple manoeuvre is often successful Beginning near the distal inter phalangeal joint wind a fine string carefully round the finger until it comes up to the ring push the end under the ring with a match stick then pull gently towards the finger tip As the string unwinds the ring comes with it Rings with stones require patience and manipulation when unwinding A little lubricant may help A very swollen finger may be first reduced in size by injecting into it 1 000 units of hyaluronidase in 1 ml of 1 per cent procaine and massaging it

expert handling at home It is best to try simple measures first Prop the patient well up with a comfortable inclination to one side arrange a large pad of wool for him to dribble into put a dental prop between his teeth *forbid him to breathe through the nose or swallow* and give a substantial dose of morphia Only by mouth breathing and a complete cessation of swallowing can the bleeding area be given the necessary and almost in fallibly haemostatic rest' (Wilfred Trotter)

As in most cases the bleeding point is at the front of the septum the next step if bleeding continues should be to put in a little wool smeared with petroleum jelly The patient should press the side of his nose against it for fifteen minutes This is more comfortable than packing

In the few cases when bleeding still goes on cauterisa tion of the bleeding point on the septum should be tried Using a dental syringe anaesthetise the skin of the nostril and the mucous membrane of the septum with 2 per cent procaine Touch the bleeding point with an electric cautery at cherry red heat If too hot it will cut the vessel and if too cold it will stick to it and tear it Cauterisation by a swab stick moistened with deliquescent crystals of trichloracetic acid is less frightening than the cautery for children

The rare serious haemorrhage from vessels on the lateral wall and posterior part of the nose and in haemophilia and hypertension should be referred to an ear nose and throat surgeon

## The Bleeding Tooth Socket

The problem usually presents to the house physician as a call to the Casualty Department to see a patient who

cult to get a clear picturc of the patient s progress from these charts In cases of dehydration the house physician is therefore advised to write a short statement each morning of the position up to 8 a m and to renew the instructions for the day

WATER DEPLETION (results from inadequate water in take with no excessive loss of salt as in coma and high fever) —Thirst Scanty urine containing salt No circu latory failure Plasma sodium normal or high Blood urea normal or slowly rising

SALT DEPLETION (results from excessive loss of salt with adequate water intake as in protracted vomiting diarrhoea and Addison s disease) —No thirst Urine not scanty but free from salt (except in Addison s disease) Peripheral circulatory failure and low B P Plasma sodium low Blood urea high (*e g* 100 mg per 100 ml ) Patient confused listless and later comatose

MIXED WATER AND SALT DEPLETION (results from ex cessive loss of salt and inadequate water intake as in acute vomiting) —Dehydrated and thirsty Urine scanty but salt present Blood urea high

### How Much Fluid? How Much Salt?

These questions are best considered under two headings

1 Prevention—how to deal with the patient in normal fluid and electrolyte balance when first seen

2 Treatment—how to deal with the patient who is already depleted of water and electrolytes when first seen

**Prevention** —Complicated electrolyte replacement is not needed at once In each period of twenty four hours a 70 Kg man needs 2 to 3 litres of water These can be

## NOTES ON FLUID AND ELECTROLYTES

**Normal plasma levels**

Sodium —143 mEq/litre (range 133 to 152) or 330 mg per 100 ml (range 306 to 350)

Potassium —5 mEq/litre (range 3 6 to 5 6) or 20 mg per 100 ml (range 14 to 22)

Chloride —100 mEq/litre (range 99 to 107) or 355 mg per 100 ml (range 350 to 380)

(Sodium chloride —100 mEq/litre (range 97 to 108) or 585 mg per 100 ml (range 570 to 630) In some laboratories only the chloride is estimated and the result expressed as sodium chloride)

Bicarbonate —27 mEq/litre (range 25 to 33) or 60 volumes $CO_2$ per 100 ml (range 56 to 74)

Proteins —15 to 20 mEq/litre or 6 to 8 G per 100 ml

**Body fluid** —The total body fluid is 60 per cent of the body weight (plasma 5 per cent extra-cellular fluid 15 per cent intra-cellular fluid 40 per cent )

Normal inevitable losses of fluid by an adult every twenty four hours are about 1 500 ml (perspiration 600 ml expired air 400 ml fluid to get rid of waste products in urine 500 ml ) The fluid in food and produced by its oxidation roughly balance the skin and lung losses and so the urinary output usually equals the fluid drunk Sweating rapid breathing youth and age increase these requirements For safety and comfort it is best to aim at giving 3 litres of fluid every twenty four hours The adult daily requirements of sodium chloride are 4 5 G (say 80 mEq or 500 ml of physiological saline) and of potassium chloride 6 G (80 mEq )

**Fluid charts** —Charts of varying kinds (usually for twenty four hour periods beginning at 8 a m ) are used in different hospitals After several days it may be diffi

litre) can be regarded as the same as that of physiological saline (160 mEq of Na per litre)

A rough idea of the amount of sodium needed can be obtained by calculation as follows —

Deficit of Na = (normal level - patient s level) × volume of body fluid

= (142 - Patient s Na level in mEq ) × 60 per cent of body weight

For a 70 Kg man with a plasma sodium of 118 mEq/litre

$$\text{deficit} = (142 \quad 118) \times \frac{60}{100} \times 70$$

$$= 24 \times 42 = 1\,000 \text{ mEq Na (approx)}$$

1 litre of physiological saline = 160 mEq Na (approx )

the required replacement

$$= \frac{\text{Deficit}}{160} \text{ litres of physiological saline}$$

$$= \text{about } 6^{1}/ \text{ litres}$$

A simple formula is—

litres of physiological saline needed

$$= \frac{142 - \text{patient s serum sodium level in mEq}}{3}$$

Such a calculation is only a rough guide for it is fallacious to suppose that knowing the body weight and the plasma electrolyte levels it is possible to calculate exactly how much salt is needed to bring the plasma level back to normal Calculations cannot allow for the state of the intra-cellular fluid or the efficiency of the kidneys and they ignore the adjustments which are continually taking place

We should judge the patient s state by considering all the evidence the history of fluid loss by vomiting diarrhoea or through a gastric suction tube or fistula

given by mouth or as a rectal drip of tap water or hypotonic saline or as an intravenous drip of 5 per cent dextrose The daily salt requirement of 4 5 G can be supplied as half a litre (one bottle) of physiological saline intravenously or if diluted by mouth or as a rectal drip

These considerations do not apply for the first few days after a major operation because various factors including the endocrine response (increased secretion of adrenal cortical and pituitary anti-diuretic hormones) result in a fall in the output of water and salt (and an increased loss of potassium) Water retention lasts twenty four to forty-eight hours and salt retention three to four days In these cases urine chloride estimations might suggest that the patient needed salt while the plasma sodium level would show that he was full of it For the first two days after operation the fluid intake should be under 2 litres in twenty four hours (say two bottles of 5 per cent dextrose and one bottle of physiological saline) A urine specific gravity under 1 010 is a signal to increase the saline intake If the patient can soon take food and fluid by mouth we need not worry further but if intravenous fluid is needed for several days it may be necessary to give potassium also A deficit should however be demonstrated first

**Treatment**—A guide to the already dehydrated patient's need for salt (except after operation) is given by the chloride content of the urine as shown by Fantus test (*see page* 74) If urinary chlorides are low (less than 4 G per litre) or when fluid is lost by vomiting then physiological saline should be given intravenously When much saline has to be given it is well to replace one bottle in three or four by M/6 sodium lactate solution to prevent acidosis Its electrolyte content (154 mEq of Na per

potassium Alternatively capsules containing 1 G of potassium chloride (13 mEq potassium) can be used

When a patient can take food and fluid by mouth we need not worry about his potassium intake but if intra venous fluid is needed for several days it is generally necessary to give potassium In all cases a deficit should be demonstrated first It is best not to give potassium until water and sodium deficits are corrected and the urinary output is good

When intravenous replacement is needed a useful solution is NaCl 2 25 G (= 40 mEq) KCl 3 0 G (= 40 mEq) 5 per cent dextrose 1 000 ml Two litres of this in twenty four hours will give the patient his 4 5 G NaCl (80 mEq) and 6 G KCl (80 mEq) Any extra fluid needed should be given as 5 per cent dextrose Darrow s solution (2 7 G KCl and 4 G NaCl per litre) is similar

Another plan is to inject potassium chloride into the bottle Not more than 1 5 G of potassium chloride should be put into one bottle since this strength (40 mEq per litre) is the maximum safe strength for intravenous administration The rate should not exceed 12 mEq per hour

## Potassium Intoxication

This results from excessive intravenous medication particularly if there is also renal failure It causes weak ness flaccid paralysis and paraesthesiae Sudden death may occur from cardiac arrest even when the patient does not appear very ill The lethal level is 10 mEq/litre (40 mg per 100 ml) Treatment is to promote diuresis by intramuscular mersalyl injections and to reduce the extra cellular potassium by causing increased cellular uptake This is done by giving insulin and dextrose (0 25 unit of insulin for each gramme of dextrose)

the presence or absence of thirst the clinical signs of dehydration (slack skin dry tongue soft eyeballs and collapsed veins) the urinary volume specific gravity and chloride content and the serum sodium and potassium levels

It must be remembered too that in addition to replacement of deficits the patient must receive also his basic needs of 1¹/₂ litres of fluid (best given as 5 per cent dextrose) and ¹/₂ litre of physiological saline (= 4 5 G NaCl)

In general it can be stated that a patient with thirst and oliguria is short of about 4 litres of fluid and if his B P is below 90 and chlorides are absent from his urine he needs 0 75 G NaCl per Kg body weight (*i e* about 4¹/ litres of physiological saline for a 60 Kg man)

### Potassium Depletion

In sodium depletion the extra-cellular fluid is hypotonic and as cell membranes are relatively impermeable to electrolytes the body cannot easily correct this completely Some potassium does pass into the plasma however but the kidneys cannot conserve it The plasma becomes depleted and symptoms result This possibility is increased if potassium free fluid is infused for several days Suggestive symptoms are muscular weakness abdominal distension and mental confusion Potassium depletion can be confirmed by estimating the serum potassium by flame photometry

**Treatment**—Potassium depletion is best corrected by giving potassium by mouth The potassium citrate mixture of the National Formulary is suitable (Pot Citrate 3 G (gr 45) Citric Acid 0 6 G (gr 9) Syrup of Ginger 4 ml (m 60) Chloroform water to 15 ml (¹/₂ fl oz) and 15 ml (¹/₂ fl oz) of it contains 25 mEq of

hour since the size of the average drop is 1/ ml One drop every three seconds (60 ml per hour) is fast enough to start with The rate should be cut down after an hour or so A useful rule is that the normal requirement of 2 /2 fl oz per pound per twenty four hours will be met if the number of drops per minute equals the weight in pounds

### Electrolyte Content in mEq of a 500 ml Bottle of Various Solutions

| | *Sodium* | *Potassium* | *Chloride* |
|---|---|---|---|
| Physiological Saline (0 9 per cent) | 80 | | 80 |
| Darrow s Solution | 117 | 33 | 84 |
| Hartmann s Solution | 143 | 5 | 55 |
| M/6 Sodium Lactate | 77 | | |
| Plasma | 76 | 3. | 76 |

### Dehydration in Addison s Disease (Addisonian Crisis)

Since symptoms are probably the result of both dehydration and hypoglycaemia both salt and dextrose should be given (2 litres in the first twelve hours of 5 per cent dextrose in 1 5 per cent saline by intravenous drip) In addition give cortisone 100 mg intramuscularly at once and then 50 mg every six hours by mouth and 10 mg of Deoxycortone Acetate B P in oil intra muscularly every six hours

### Dehydration in Children

Infants have a water turnover five times greater than adults because their greater metabolism means more waste products have to pass through their relatively in efficient kidneys A *chloride output of 2 to 3 G per litre* is normal for a child

**Type of fluid** —Never use full strength physiological saline for an infant Use half strength physiological saline in 4 per cent dextrose or half strength Hartmann s solution (Compound Injection of Sodium Lactate B P 1953)

**How much fluid?**—The daily fluid requirements of *normal* children are

During 1st year—2¹/ fl oz (70 ml) per pound of expected body weight
At 3 years—32 to 50 fl oz (1 000 to 1 500 ml)
At 8 years—50 to 65 fl oz (1 500 to 1 900 ml)
At 12 years—70 fl oz (2 000 ml)
A dehydrated child needs *extra* fluid the amount being

$$\frac{\text{Difference between actual and expected weight}}{\text{Expected weight}} \times \text{Expected requirements}$$

*Example* —Expected weight 15 lb Actual weight 12 lb Difference = 3

Expected requirements = 2¹/ × 15 = 37¹/ fl oz
Extra fluid needed is / of 37¹/₂ = 7¹/₂ fl oz

**Route** —*By mouth* if possible Otherwise intravenously or subcutaneously with Hyalase (Benger) 100 units or Rondase (Evans) 3 mg injected into the tubing

**Rate of drip** —The average drip bulb *kept* at one drop per second should deliver 3 ml per minute or 180 ml per

10 red portions contain the average amount of protein and fat normally eaten by adults and yield about 1 G protein per Kg body weight

10 black portions is the minimum amount of carbohydrate advised since 100 G carbohydrate are necessary to prevent ketosis

**Insulin** —In using a mixture of soluble insulin and protamine zinc insulin adjust the proportions so that the urine is sugar free or nearly so (1) before breakfast—to make sure the P Z I is enough (2) before the mid-day meal—to make sure the soluble insulin is enough

The bladder should always be emptied half an hour before a further specimen is passed for testing

Make any increment or reduction at least one fifth of the previous dose The effect of smaller changes is inappreciable

RULE FOR CHANGING FROM SOLUBLE TO P Z I + SOLUBLE —Give / of the previous total daily dose of soluble insulin as P Z I and add it to half the previous morning dose of soluble insulin A daily dose of 12 units or less can be replaced entirely by P Z I Always take the soluble insulin into the syringe first for it does not matter if a little contaminates the P Z I bottle

## DIABETIC KETOSIS (PRE COMA AND COMA)

Diabetic ketosis should not be treated by rule of thumb but a basic outline of the method will give the house physician confidence He should always seek the advice of his senior colleague

**Pre coma** —(Patient conscious and able to swallow) This comes on gradually (in contra-distinction to insulin coma) The patient goes off his food and is drowsy The urine contains diacetic acid (ferric chloride test) Put the patient on a four hourly regime Give a dose of in ulin

### COMA

When coma is the presenting symptom you will gener ally see the patient in the receiving room Use a common sense approach The police or relatives may provide the diagnosis at once Answers to the following three questions will usually point to the cause

1 Is there a previous history of disease which might cause coma? *e g* diabetes (test urine for ketone bodies) insulin coma (if suspected give dextrose *10 G intravenously) nephritis (test urine for* albumin) pernicious malaria (examine thick and *thin blood films)*
2 Does the immediate past history point to the cause? *e g* injury (do not too readily assume that is the whole cause) poisoning (including alcohol) epil epsy (fits may be symptomatic of other disease—hypertension nephritis meningitis)
3 Are there any physical signs of disease in the central nervous system? *e g* of cerebral vascular accidents and meningitis

*Always* make a *full* examination and *record the* findings These must include the urine pupils fundi heart rate blood pressure and temperature Beware of saying a patient is only drunk and handing him over to the police when he might have a head injury also It is wiser to admit him dead drunk than for him to be found dead at home from some other cause next morning

### NOTES ON DIABETES

**Lawrence s line diet**—1 line = 155 calories 1 black portion = 10 G carbohydrate = 41 calories 1 *red* portion = 7½ G *Protein* + 9 G fat = 114 calories

One and a half hours later (i e two hours from onset) estimate blood sugar again

If rising give double the previous dose of insulin
If the same give the same dose of insulin
If falling give no more insulin

When the blood sugar is falling and provided the urinary output is good change the drip to potassium glucose solution which contains 5 per cent dextrose (Sodium lactate 2 2 G Potassium chloride 1 0 G Sodium chloride 0 6 G Potassium hydrogen phosphate 0 5 G Dextrose 50 G per litre)

One and a half hours later (i e three and a half hours from onset) estimate blood sugar At four hours from onset give more insulin if blood sugar is not falling

Give nothing by mouth until the blood sugar starts to fall When consciousness returns and fluids are retained change over to the four hourly regime as for pre-coma Control by urine tests however is of little value until the blood sugar approaches the renal threshold and certainly not if it is over 300

When swallowing is adequate potassium should be given by mouth every four hours until food can be taken

The Potassium Citrate mixture of the National Formulary is satisfactory (*see page* 136)

Additional measures are gastric lavage if there is much vomiting blood transfusion if the B P is low antibiotics for infection and vitamin B complex (Becosym Roche 2 ml in twin ampoules)

Comatose diabetics should be nursed with the greatest care Do not sit them up in bed until fully conscious and rehydrated lest sudden cardiac failure closes the scene

up to 100 units and 50 G carbohydrate (10 G carbohydrate are contained in 2 lumps of sugar 4 fl oz orange juice 7 fl oz milk 2 teaspoonfuls of Benger s food Horlick s milk or Ovaltine The proprietary drinks Lucozade and Glydexil contain roughly 20 per cent W/V of glucose *i e* 20 G in 100 ml ($3^1/_2$ fl oz))

A little weak tea or Marmite may be given at any time

After three hours empty the bladder and before the fourth hour empty it again and test the urine by Benedict s test The result will decide the next dose of insulin

*If red give 40 units*
*yellow give 30 units*
*green give 20 units*
*blue give no insulin*

50 G carbohydrate is given every four hours and this goes on until ketosis has cleared—usually in 24 hours The patient should then get back to his usual diet

Look carefully for any infection which might have caused ketosis

**Diabetic coma**—(*Patient unconscious and unable to* swallow) Give 100 units insulin ($^4/_5$ *i e* 80 units intramuscularly and $^1/$ *i e* 20 units intravenously) Take blood for blood sugar (blood sugar control is necessary in the early stages)

Set up an intravenous drip of physiological saline or saline lactate (300 ml $\frac{M}{7}$ sodium lactate with 700 ml physiological saline) to give 3 litres in three hours (*i e* drip bulb at 5 drops per second)

*Blood sugar level is known in say thirty minutes*

If over 600 mg per 100 ml give another 100 units insulin (20 units of it intravenously)

## POISONING

Suspect poisoning or overdosage in any comatose or curiously ill patient The general principles of treatment are to remove or neutralise the poison and to keep the patient alive by dealing with whatever state is most threatening life These measures are more important than the use of antidotes except in those cases where there is a very specific antidote and the poison is known While getting ready to wash out the stomach a dessertspoonful of Universal Antidote may be given if available and if the patient can swallow

> Powdered activated charcoal 2 parts
> Magnesium oxide (or milk of magnesia) 1 part
> Tannic Acid (or very strong tea) 1 part

Make it into a paste before swallowing

Don t let this procedure delay gastric lavage which is more important

**Carbon monoxide poisoning**—Clear the airway by pulling forward the tongue Give 7 per cent CO in oxygen by an oro nasal mask Use artificial respiration if the breathing is shallow

***Aspirin poisoning***—*Wash out the stomach*—with the head low so as to avoid inhalation of gastric contents Give sufficient bicarbonate of soda to keep the urine alkaline—if necessary by intravenous injection (Bicar bonate in solution decomposes on boiling so simply boil the water first and then add bicarbonate powder under sterile conditions) Warmth oxygen and other measures for shock may be needed

## DIAGNOSIS OF THE CAUSE OF COMA IN A DIABETIC

| *Cause of Coma* | *Colour* | *Breathing* | *Eyes* | *Tongue* | *Benedict* | *Ketosis* | *Babinski's Sign* |
|---|---|---|---|---|---|---|---|
| Ketosis | Flushed | Air hunger Acetone in breath | Soft | Dry | + + + + | + + + + | ↓ |
| Hypoglycaemia | Pale | Normal | Normal | Moist | Probably Nil | Nil | ↑ |
| Stroke | Flushed or pale | Stertorous or Cheyne Stokes | Pupillary changes | Normal | May be + | Nil | ↑ |
| Drugs | Varies | Slow and shallow | *May be* small pupils | Normal | Nil | Nil | May be ↑ |

for the patient and if a prosecution would not be in the patient s interest avoid saying anything which might make it take place Steps to avoid a further attempt—such as moving the patient away from an upstairs window—would be wise

### Food Poisoning

Bacterial food *poisons* —Symptoms within two to four hours after eating Usually cream cake or trifle containing staphylococcal toxin

Bacterial food *infections* —Symptoms more than twelve hours after eating Often manipulated meats (salmonella organisms)

Note the foods eaten take charge of any remains save vomit and faeces and notify the Medical Officer of Health Don t ask for agglutination tests until the stools have been cultured or in any case during the first week

Treatment —If vomiting is troublesome wash out the stomach Give castor oil 30 ml (1 fl oz) for an adult Start fluids by mouth when possible otherwise give intravenously Give bismuth and opium or similar mixture

Avoid giving a certificate of Food poisoning until proved It may be wanted simply to blackmail a restaurant

### Poisonous Foods

Treatment should be on general lines unless there are special remedies

Belladonna poisoning —Usually a child who has eaten berries and is found confused flushed and dry Empty the stomach by tube or emetic (2 tablespoonsful of salt to half a tumbler of water is preferable to apomorphine in these cases) and give neostigmine (Prostigmin) 0 5 to 1 0 mg intramuscularly

**Barbiturate poisoning**.—Wash out the stomach. Only use an emetic (apomorphine 7.5 mg (gr 1/8) subcutaneously) if a stomach tube is not available. Decide whether poisoning is mild (patient conscious), moderate (patient stuporose) or severe (patient comatose). In severe cases give an analeptic. Methylamphetamine hydrochloride (Methedrine) 15 to 30 mg intravenously and repeated half hourly if necessary is safe. The more powerful picrotoxin is not approved of by all so consult your chief before using it. It is given in doses of from 2 to 40 mg intravenously every fifteen minutes according to the depth of coma. Overdosage will cause convulsions and the *dose to aim at is one which just causes facial twitchings* and return of corneal reflexes. The effects of picrotoxin do not come on at once so don't give it more often than every fifteen minutes lest cumulation cause convulsions. Lumbar puncture, artificial respiration and intravenous fluid may all be needed. Mild and moderate cases may be simply nursed and watched for progress. In all cases penicillin should be started. A new barbiturate antagonist Megimide 50 mg intravenously may be used instead of an analeptic. Consult your chief before trying it.

**Antidotes**.—For morphine poisoning use nalorphine (Lethidrone, Burroughs Wellcome) 5 to 10 mg. It also antagonises pethidine and methadone (Physeptone) but *not barbiturates*.

For cyanide poisoning use amylnitrite by inhalation.

For mercury poisoning use BAL (Dimercaprol) 300 mg intramuscularly and then 150 mg four hourly.

SHOULD YOU TELL THE POLICE?—No, attempted suicide is a misdemeanour only and you are under no legal obligation to report it. Always do what you think best

THE RED EYE

| | *Conjunctivitis* | *Keratitis* | *Iritis* | *Glaucoma* |
|---|---|---|---|---|
| Discharge | + | Watering only | Watering only | Watering only |
| Pain | Discomfort only | + | ++ | +++ and vomiting |
| Vision | Normal | Depends on how much opacity covers the pupil | Reduced | Greatly reduced |
| Congestion | Conjunctival | Ciliary | Ciliary | Ciliary |
| Corneal transparency | Normal | Localised opacity | General haze | General clouding |
| Anterior chamber | Normal | Normal | Normal | Shallow |
| Iris and pupil | Normal reactions | Small and reacts to light | Small and bound down Reflexes may be absent | No reaction to light |
| Tension | Normal | Normal | Perhaps a little increased | Greatly increased |
| The other eye | Often affected also | Old scars of previous ulcers | May be old iritis with bound down pupil | May be cupped disc |

Mushroom' poisoning — Treat on general lines unless poisoning by Death Cap (*Amanita phalloides*) is suspected Confirm this by—

1 Examining uneaten fungi The Death Cap has white gills
2 Noting the twelve hour interval before symptoms begin
3 Sending vomit and faeces for examination for spores

Treat by anti phallinic serum (Central Public Health laboratory Colindale Avenue N W 9 COLindale 7041) and possibly the rabbit stomach brain treatment (see *Emergencies in Medical Practice 4th Edition page 67*)

### The Red Eye

The patient with a red eye presents the house physician with a worrying problem If in serious doubt he should seek expert advice The following table will help him to decide It is good practice to use a drop of 1 per cent amethocaine hydrochloride to facilitate examination of a painful eye

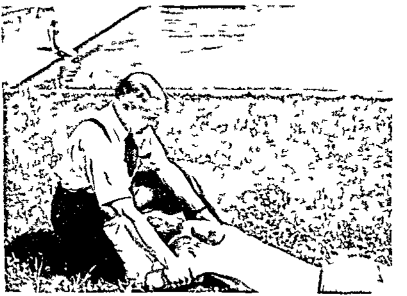
### Tracheotomy

Nearly always the patient needing tracheotomy can be moved to the theatre and a planned operation performed Should urgency preclude this then quickly obtain a scalpel an artery forceps and a catheter or piece of stout rubber tubing With the patient s neck fully extended hold the larynx firmly between the left thumb and middle finger and place the forefinger on the cricoid Incise downwards exactly in the middle line and through the first two tracheal rings Even though you have never done it before you won t find it difficult Don t bother about



FIG 1

Holger Neilsen method Showing the position of the operator s hands (shown as gloves) his left foot (shown as a shoe) his right knee and also the correct position of the patient s arms and head



FIG

Holger Neilsen method Inspiration Duration ~ / secs [ g p 1a)

bleeding it is usually a good sign and brings relief Push the rubber tube through the tracheal opening Having thus saved the patient s life call your surgical colleague and let him put in a proper tracheotomy tube

## Artificial Respiration

Holger Neilsen s technique (a push and pull method) is the best and is now officially recommended by the British Red Cross Society

The chest is compressed against the ground for ex piration and raised by the arms for inspiration

1 Turn the patient face downwards with arms upwards and elbows flexed so that his head is turned to the side and rests on his hands

2 Kneel on one knee at the patient s head and facing his feet The opposite foot is near the patient s elbow (Fig 1)

3 Inspiration Grasp the arms above the elbows and rock backwards (Fig 2) raising the arms until tension is felt Count 1 2 3 while doing this (= $2\frac{1}{2}$ seconds)

4 Expiration Drop the arms (Fig 3) and put your hands on the patient s back just below the scapulae with your thumbs touching (Fig 4) counting 4 as you do it Rock forwards with your elbows straight and exert steady pressure on the chest (Fig 5) count 5 6 7 while doing this (= 2 / seconds)

5 Slide your hands off the chest and on to the patient s arms as you count 8 This cycle should be repeated ten to twelve times a minute

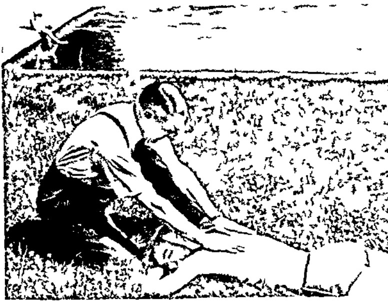


Fig 4

Position of operator's hands and arms at beginning of expiration



Fig 5

Expiration Operator rocks forward with his arms straight Duration ? secs

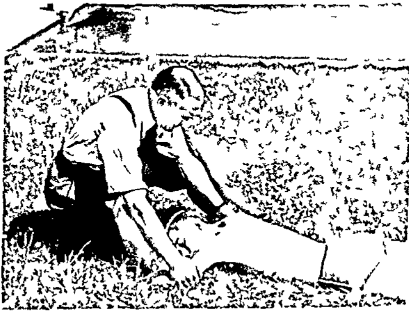


FIG 3
Holger Neilsen method Patient's arms dropped at end of inspiration

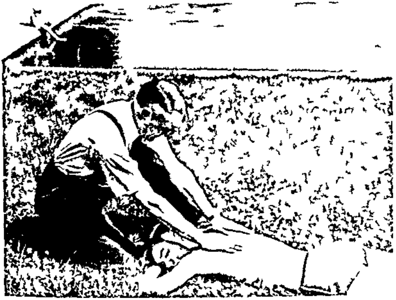


FIG 4
Position of operator's hand and arms at beginning of expiration



FIG 5
Expiration Operator rocks forward with his arms straight Duration [illegible] secs

### Some Urgent Medical Accidents

Almost any of the common medical procedures used by the house physician may on occasion prove hazardous He should be aware of what might go wrong and know what he would do if it did Here are a few reminders

**Wrong injections** —*Always read the label* on the bottle before using its contents

**Broken needles** —Test the strength before use If a needle breaks and a little projects remove it with forceps Otherwise immobilise the part and leave it alone until X ray examination and a planned operation can be made Tell the patient but don t admit liability Keep the parts and report to your Medical Defence Society

**Accidental intra arterial injection** —Avoid this by palpation (for pulsation) and drawing back blood before injecting (to note bright red arterial blood) If it happens as shown by pain in the hand leave the needle *in situ* and slowly inject into it 5 ml of 2 per cent procaine followed by 30 mg (1/ grain) of papaverine in 20 ml of physiological saline

**Accidental injection of a toxic dose** —If in a limb apply a tourniquet and release momentarily at intervals Elsewhere consider incision and apply ice Use an anti dote *e g* nalorphine ( Lethidrone ) for morphine over dosage

**Potain's aspirator** —Make sure that the pump is evacuating the bottle and not filling it with air under pressure

***Gastric lavage*** —In a comatose patient (*i e* with no cough reflex) always have the head lower than the stomach so that should the larynx be entered drowning won t result

### ANAPHYLAXIS

Always ask about asthma and urticaria before giving an injection of serum or any foreign material Before giving serum always test for sensitiveness Puncture the forearm with a hypodermic needle (= control) and do it again nearby through a drop of serum Redness and wheal formation within fifteen minutes mean sensitivity In such a case the first dose of serum should be 0 1 ml and this should be doubled at half hourly intervals for six doses and then the rest can be given Each dose should be combined with 0 3 ml of Injection of Adrena line B P Should anaphylaxis occur give Injection of Adrenaline 0 5 ml and Injection of Nikethamide 2 ml intra muscularly at once

### AIR EMBOLISM

If collapse follows needling of the chest or in pneumothorax refills air may have entered the left heart and reached the coronary arteries or brain Withdraw the needle lower the head and turn the patient on to his left side The portion of the aortic orifice uppermost will then be the part which does not have a coronary orifice in it A similar accident following injection into a peri pheral vein will fill the right heart with froth (or cross to the left side by a patent foramen ovale— paradoxical embolism ) Treat in the same way The risk of frothy blood rising into the outflow tract of the right ventricle is lessened by lying on the left side

## Drug Addiction

This may present itself to the house physician in two ways —

1 As a puzzling case of mysterious illness whose cause (drug deprivation) the patient does not disclose Suspicion can often be confirmed by finding numerous marks of needle punctures—often infected Admit the patient and seek further advice

2 As a self-confessed addict who asks for his drug because he can t buy it Regard him as a sick person and don t turn him away Give him one dose of drug and refer him to his own doctor if he has one If the patient has no medical source of supply give him enough drug for a few days persuade him to see a psychiatrist with a view to treatment and (preferably with the patient s permission) notify the Home Office It is best to give any supply of drug as a solution so that it is less easy for it to be sold

# CHAPTER V

## *X-ray Department*

If you have a patient X rayed on your own responsibility e g from the Casualty Department always see the film and then see the radiologist s report also in case you have missed for example a fracture

When examining a film the first thing to do is to make sure that it refers to the patient in question Grave consequences have followed the wrong labelling of films Be particularly watchful if there are two patients of the same name or if the X ray and clinical findings are inexplicably at variance

When filling in the request forms always be careful to give the patient s names (and unit number) correctly and indicate how the patient will reach the department i e stretcher chair walking or carry Do not ask for portable X rays unless the patient cannot go to the X ray department If a portable film is wanted other than of the chest or a limb discuss the case with the radiologist first

### PREPARATIONS FOR VARIOUS X RAY EXAMINATIONS

**Barium meal and follow through** —Give an aperient (vegetable laxative pills or cascara but not castor oil) two *nights before the examination Give a light diet on the* day before but nothing at all liquid or solid must be given after midnight preceding the examination The stomach must be empty when the examination begins Bismuth medicines should be discontinued five days

before the examination Follow through cases attend again in the afternoon and next morning No enemas or aperients must be given until the examination is complete

**Barium enema**—An aperient should be given two nights before the examination A few hours before it a thorough high bowel wash out should be done The aperient should be omitted in cases of ulcerative colitis but if the examination is unsatisfactory it should be pre ceded next time by a wash out with warm physiological saline

**Plain X ray of the abdomen**—The patient should be encouraged to have his bowels opened before attending for this

**Cholecystography**—The stomach should be empty and the bowel as free of gas and faeces as possible No laxative should be taken however but an enema may be given on the morning of the examination Nothing should be eaten after the evening meal which should consist of non fatty foods All fats including milk cream butter eggs mayonnaise and fried foods should be avoided A little water may be drunk up to bed time The patient should swallow 6 Telepaque (Iopanoic acid B P C) tablets one at a time after supper and report next morning without having had any breakfast Films of the gall bladder are made ten to twelve hours after taking the tablets A fatty meal (2 egg yolks in a glass of creamy milk) is taken and films made ten and forty minutes later These films may show the cystic and common bile ducts The hepatic duct is not normally seen

**Intravenous cholangiography** (to show the biliary ducts)—The general preparation to rid the bowel of gas should be as for oral cholecystography but it is not

absolutely necessary Biligrafin is injected intravenously taking five minutes (This is a preparation containing 64 per cent iodine prepared by Schering A G Berlin A 20 per cent solution is isotonic and only slightly irritant) It is wise to make a 30 second pause after 2 ml have been injected Films of the gall bladder area are taken twenty minutes after the beginning of the injection and at forty and sixty minutes and at two hours Finally a film is made fifteen minutes after a fatty meal Concentration of Biligrafin in the gall bladder is not necessary for visualisation and so the method is valuable in cases of non functioning gall bladder '

**Excretion urography** (often erroneously termed Intra venous Pyelography or I V P )

The patient should be on a light diet and should take an aperient on each of the two preceding nights No food or drink should be taken for eight hours before the examination The bowel should be as empty of gas as possible *This is facilitated if the patient is up and about* Pitressin 0 5 ml may be given half an hour before the examination at the discretion of the doctor (It may make the patient ghastly pale) Diodone 20 ml is injected into an elbow vein and films are taken ten twenty and thirty minutes later

Avoid excretion urography in asthmatic and allergic patients and in those suffering from cardiac failure and uraemia Intensive sulphonamide therapy should be avoided just before excretion urography

SUBCUTANEOUS METHOD FOR CHILDREN —For children up to five years 1 000 Benger units (= 500 turbidity reducing units) of hyaluronidase are added to 5 ml of 35 per cent Diodone and made up to 15 ml with distilled water This amount should be injected *subcutaneously*

over *each* scapula (*i e* 30 ml in all) and massaged This method will give satisfactory pyelograms

**Bronchography**—This is best carried out in the case of a child in conjunction with the anaesthetist The method used will depend on which one the operator knows best Tipping several times a day before the examination will render the bronchial tree as free of secretions as possible Bronchi of the right lung are best seen on the lateral film and those of the left lung in the oblique film The right side is filled first to avoid over lapping

Dionosil is a good preparation to use because it is soon absorbed 8 ml for each lung is sufficient for children up to eleven years Four syringes should be prepared—one for each lung and two in reserve in case of need Shake the Dionosil well and pour it into the oiled dry syringe Afterwards disconnect and wash at once—otherwise the syringe is easily gummed up

No special preparation is needed for X ray examination of the pharynx and oesophagus or the heart

# INDEX